About

This Interactive Course Design Model was developed as a result of the IMPACT project at Purdue University. It has gone through several iterations due in large part to the dedication of the IMPACT team members.

The online version of this guide is available at: http://www.itap.purdue.edu/learning/cdm/

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Suggestions?

If you have suggestions, or comments, please send them to Pat Reid (patreid@purdue.edu).

We are happy to consider corrections, adding resources, clarifying wording, etc.!

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Changes last made: 01/21/2015
What Do You Want To Accomplish? ................................................................. 21
3. Identify Learning Outcomes ........................................................................... 21
   Outcomes ........................................................................................................ 21
   Overview .......................................................................................................... 21
   Definitions ........................................................................................................ 21
   A bit of theory: Taxonomies ............................................................................ 21
   Developing Outcomes ...................................................................................... 23
   Tie to the core curriculum .............................................................................. 23
   Actions .............................................................................................................. 25
   Completing the assessment map .................................................................... 25
   Defining learning outcomes and how to write them .................................... 26
   Taxonomies Resources .................................................................................... 26

4. Structure Course Components ...................................................................... 27
   Outcomes ........................................................................................................ 27
   Overview .......................................................................................................... 27
   Sequencing ....................................................................................................... 27
   Objectives ......................................................................................................... 27
   Developing objectives ..................................................................................... 28
   How to write objectives ................................................................................... 28
   Need help writing objectives? ........................................................................ 28
   Actions .............................................................................................................. 29
   Resources ........................................................................................................ 29

How Do You Want To Approach It? ............................................................... 30
5. Identify Learning Model ................................................................................. 30
   Outcome ........................................................................................................... 30
   Overview .......................................................................................................... 30
Transformative pedagogies and designs ................................................................. 31
The iterative process .............................................................................................. 32
Actions for identifying your own unique approach .............................................. 32
Actions for identifying a common model to fit your needs .................................. 33
Resources .............................................................................................................. 34
Common approaches ............................................................................................. 34
Models using transformative pedagogies ............................................................ 35
Models which maintain traditional lecture .......................................................... 36
Models with an Online Focus .............................................................................. 40
Models with a combination of online & classroom .............................................. 46
6. Develop Instruments to Evaluate Students ...................................................... 68
   Outcomes .......................................................................................................... 68
   Overview .......................................................................................................... 68
   Actions .............................................................................................................. 69
   Completing the assessment map ...................................................................... 69
   Technologies to support Assessment and Evaluation ....................................... 69
   Resources ......................................................................................................... 71
What Methods And Activities Will You Use To Get There? ................................. 73
   Outcomes .......................................................................................................... 73

7. Develop & Teach Course ................................................................................... 73
   Overview .......................................................................................................... 73
   Identify Activities ............................................................................................. 73
   Develop Class Outlines or Lesson Plans .......................................................... 78
   Teach ............................................................................................................... 81
   Evaluate and Reflect ....................................................................................... 82

8. Evaluate Course .................................................................................................. 84
   Outcomes .......................................................................................................... 84
   Overview .......................................................................................................... 84
   Actions .............................................................................................................. 84
   Resources ......................................................................................................... 85

Appendices ............................................................................................................ 87

IMPACT assessment techniques ........................................................................... 88
Catalyzing Change in Faculty .............................................................................. 88
Student Perceptions .............................................................................................. 89
Student Learning and Retention ........................................................................... 90
Welcome to Purdue's Interactive Course Re/Design
(http://www.itap.purdue.edu/learning/cdm/index.html)

Developed and written by Dr. Pat Reid, Dr. Frank Dooley, Clarence Maybee and Dr. David Nelson
With contributions from IMPACT Support Team members

Most college-level instructors have spent their entire career in an academic setting. Yet few have much exposure or training to the subject matter of designing and developing a course.

Course design and development can be complex as it involves a wide variety of skills and tasks including identifying learning outcomes, developing instruments for measuring student learning, designing activities, and developing class outlines.

This Interactive Course Re/Design model (ICD) provides a sound, pedagogical approach to course design with links to resources that offer guidance on each step in the process. The ICD model is specifically designed to encourage development of active learning and supports the ‘backward design’ pedagogical concept of determining what you want to accomplish before deciding how you want to approach it. The following ICD guide provides:

- An overview of the full process
- Descriptions of the steps within the process model
- Actions for each step
- Additional resources

This site was written by a group of individuals at Purdue working with IMPACT (Instruction Matters: Purdue Academic Course Transformation). It is a temporal, physical manifestation that highlights the wealth of information found at the IMPACT web site (see www.purdue.edu/IMPACT).

Relationship to IMPACT
Instruction Matters: Purdue Academic Course Transformation (IMPACT) is a project currently targeting foundational courses for redesign to incorporate more active learning. In part, this document was created to support IMPACT’s faculty fellows through the course redesign process. Since its inception in 2011, new insights regarding best practices brought into the IMPACT project have also made their way into this document. While this site stands on its own as a guide for course design, it has a reciprocal relationship with the IMPACT project, each benefiting from the development of the other.

Relationship to the Scholarship of Teaching and Learning (SoTL)
SoTL is the systematic study of teaching and learning where research is conducted in a scholarly manner based upon theory or prior research, clear research questions and hypotheses, and other appropriate methodology. SoTL encourages public sharing and review. SoTL also shares established criteria of scholarship in general. This is made public, where the processes and outcomes - the work - can be reviewed by peers and judged to have merit and significance in the field of interest. The criteria can be built upon, replicated, and elaborated on by others in order to advance the field of study. It is very ground-breaking in that it contributes to the literature.
Faculty involved in course re/design have a unique opportunity to engage in SoTL. Course design completed using a systematic methodology such as that presented here, can identify begin by identifying how they will measure the success of the design. For more information:

- see the Scholarship of Teaching & Learning (SoTL) and/or
- contact the Center for Instructional Excellence

**Relationship to student-centered learning**

A major purpose of the IDC model and the IMPACT program is to encourage student-centered learning. This can only happen through intentionally designing courses and curriculum specifically for student-centered learning. The information under "How do you want to approach it" will help identify a structure supporting active learning. The "what methods and activities will you use to get there" section will help ensure the model/structure meets the goals. Click here: What is being said about student-centered learning? for some quotes on the effectiveness of student-centered learning.

**For Faculty Members**

This website is designed to help you design and/or redesign courses focused on student learning. While all instructors are concerned about helping students learn, they may not be consciously aware of the steps involved in pedagogically sound course design. The Interactive Course Design model presents a logical sequence four-step process for course redesign. At the same time, each step provides you with suggestions and guidelines, not absolute rules. Within this framework, you have the ability to purposefully create a course that meets your unique needs.

The process walks through four key questions and each question covers two steps:

1. **Where are you starting from?**
   - Review requisite and subsequent courses
   - Identify student characteristics
2. **What do you want to accomplish?**
   - Identify learning outcomes
   - Structure course components
3. **How do you want to approach it?**
   - Identify the learning model(s)
   - Develop instruments to evaluate students
4. **What methods and activities will you use to get there?**
   - Develop and teach the course
   - Evaluate the course
The design is interdependent — that is, you may work on several steps simultaneously. And you may find you have already identified your approach to one or more steps and therefore not need to spend much work there at all. The process is also continual. Even the best teacher constantly tinkers with their course to keep pace with changes in our students, technology, subject matter, etc.

For Deans and Department Heads
This website describes the Purdue Interactive Course Design model (ICD) for higher education faculty. In the corporate world, systematic course design models are common and usually based on the ADDIE approach which details five steps in identifying needs and designing a course to match - Analysis, Design, Development, Implementation and Evaluation (Edutech Wiki on ADDIE). In corporate training the instructor is usually tasked with solving a performance issue or teaching a very specific new skill or knowledge set, with very short and compact timeframes. These, however, are not a good fit for higher education as they do not match what a faculty member needs to consider. Therefore, at Purdue we created an interactive course design/redesign model (ICD) for faculty.

The ICD model presented here is developed specifically to match faculty concerns. Although many times instructors design a course based on content they want to cover, this model presents a “backward design” (Edutech Wiki on Backward Design) approach which is the concept of determining the desired end result of student learning and then designing the course to meet this goal. While the ICD model is an example of ‘Backward design’ it details specifically for faculty members concerns and considerations.
in language and actions they can understand. With a few exceptions, rather than a theoretical approach, this is a practical model based on pedagogical and andragogical theories.

For Faculty Development Team Members
This website presents a course design model for higher education faculty. By providing faculty with a complete framework for purposeful course design, we can support them in sound instructional design. Using this framework can help faculty recognize the various skills and knowledge needed in course design as well as see a logical sequence. This site provides the framework and some key concepts to support both new faculty members and those interested in a reflective look at redesigning their courses.

You may also find this useful when offering workshops, one-on-one consulting and support, blogs, etc. These can all be tied to a section of the ICD model to clarify purpose and scope. For example, a workshop on developing multiple choice assessments can be tied to the “Develop instruments to evaluate students” step. A workshop on team-based learning or supporting student groups could be tied to the “Develop and Teach” step.
Introduction
(http://www.itap.purdue.edu/learning/cdm/intro.html)

Course redesign includes a range of activities that must all be considered and managed to ensure the resulting course redesign is complete, content-appropriate, and pedagogically and technologically sound. It is more than deciding to incorporate active learning into a course. It involves reviewing the fundamental purposes of the course and using those to develop the measures of student learning, and an over-all look-and-feel (the academic transformation model), and then designing purposeful student activities and learning technologies into each lesson.

This is a living website and has direct ties to a wide variety of topic areas such as A bit of theory: Taxonomies, Transformative pedagogies and designs, Identify Activities, 6. Develop Instruments to Evaluate Students, 8. Evaluate Courses, etc. As key articles and resources are identified, they will be added.

While we understand that most instructors have successfully been designing, developing, and delivering courses, possibly for years, we offer the ICD model to ensure that we have a common terminology, understanding, and approach to course design. Thus, our objectives are to provide:

- a common understanding and terminology for course design
- a pedagogically sound yet flexible process for redesigning courses
- a well-rounded set of resources to provide support at each step

Basic pedagogical principles
The Interactive Course Design Model (ICD) is based on Chickering & Gamson's 7 principles for good practice in undergraduate education, Bloom's Taxonomy (and others), active learning, and several others - these are introduced at various points throughout the model. However, here are some introductory concepts:

2. Review ITaP's website on these principles: https://www.itap.purdue.edu/learning/innovate/principles/

“This seems regimented”
Our intention is not to force you to strictly follow a step-by-step process. As an instructor, you may find that some steps have already been completed. For example, you may have been given outcomes and objectives, or it may have already been determined that this will be a completely online course. You will then be able to skip or race through these steps in the model.

In addition, you may find you work best by working on several steps simultaneously. The model provides flexibility. Instead of being rigid, we hope to provide you with some ideas and thoughts on how to approach course design/redesign and considerations for each step. If you feel you have completed a step, then a quick check of the write-up and actions for that step will help you validate this.
“I would like some help”
In addition to other faculty in your department, Purdue instructors can contact any of the support areas that helped pull this website together:

**Center for Instructional Excellence** – instructional design, teaching methods, etc. The Center for Instructional Excellence (CIE) promotes innovative pedagogies and curricular synergies at Purdue University by serving as a support structure and advocate for continuous improvement in teaching, learning and service in combination with Instructional Data Processing (IDP) assessments and evaluations, and provides general service for facilitating campus enhancement/development.

- [http://www.purdue.edu/cie/](http://www.purdue.edu/cie/)
- [cie@purdue.edu](mailto:cie@purdue.edu)

**Information Technology at Purdue (ITaP)** – instructional design and use of instructional technologies. We support, promote, empower and advance the innovative and evolving use of technology to facilitate learning. We have a staff of educational technologists who offer consulting and training to faculty. We can help in course redesign and development, and provide support for Purdue’s enterprise-level instructional applications.

- [https://www.itap.purdue.edu/learning/](https://www.itap.purdue.edu/learning/)
- [itap@purdue.edu](mailto:itap@purdue.edu)

**Libraries** – instructional design and information literacy - Our mission is to advance the creation of knowledge for the global community through provision and preservation of scholarly information resources; teaching of information literacy; research in library, archival, and information sciences; and the development of dynamic physical and virtual learning environments.

- [http://www.lib.purdue.edu/infolit/](http://www.lib.purdue.edu/infolit/)

**IMPACT** – In addition, you could look at applying for the IMPACT program ([http://www.purdue.edu/impact/](http://www.purdue.edu/impact/)) – in this program, faculty are provided financial support and are assigned a support team from CIE, IDC, and/or Libraries. Weekly faculty learning consortium meetings are held for a semester to work through the ICD process with a course.

**Terms**

**Learning Outcomes or Learning Objectives?** – Unfortunately, the definitions for learning outcomes and learning objectives are not universal across universities or even within a campus. Moreover, your accrediting agency may use them differently as well! The following definitions describe how these terms are used in ICD. Our usage is consistent with the approach used in the new core curriculum at Purdue.

**Learning outcomes** refer to the large or overarching goals you have for your course. Within the course design model we will give examples and will discuss the learning outcomes in detail. We explain this more in the “Identify Learning Outcomes” step.

**Learning objectives** – Within course redesign we use this term to mean the more concrete or specific goals which make up a learning outcome. So, for each learning outcome, you likely will have several learning objectives. We cover these in the Identify Learning Outcomes and Structure Course Components steps.
Class Outlining – This refers to a description of how you will conduct student learning on a specific objective (or, if closely connected, a series of objectives). Typically, each class outline will include the flow of activities and topics, timing, and perhaps materials and preparation notes. A class outline is not intended to equal one class session. Rather, it may take several class sessions to complete coverage of a topic area. Class outlines may be formatted as lesson plans. These are discussed further in the “Develop and Teach” step.

Assessment Terms – we also have identified terms to indicate specifically what we mean by ‘assessment’ as this term can be used in a multitude of ways:

Measuring student learning – using activities, exams, term papers, quizzes, essays, projects, case studies, exercises, homework, etc. to evaluate student learning. See the “Develop instruments to evaluate students” step for more information.

Student evaluation of teaching – evaluations such as Small Group Instructional Diagnosis (SGRID), 1-minute papers, end-of-course or Student Assessment of their Learning Gains (SALG) evaluations, etc. This is discussed in the “Evaluate course” step.

IMPACT program assessment – within the IMPACT program, special assessments are conducted to evaluate the effectiveness of various learning experiments.

SoTL – the Scholarship of Teaching and Learning - Applying and making public, assessment and/or research on one’s classroom teaching and students’ learning. The ICD process provides a structure for forming pedagogically sound courses, assessments, and lessons. These support the SoTL process. If you are interested in more about SoTL, please see the SoTL section, or contact CIE (cie@purdue.edu) or the International Society for the Scholarship of Teaching & Learning

Planning Your Course Design
Another possible use for the Purdue Interactive Course Design Model is for planning. Creating or redesigning a course can take a lot of time. And it can cause some concerns that you will not be able to complete it by the needed end date.

One approach to identifying the time required for your project is to use a printout of the model (Available here) to plan your time:
1. Next to the “Develop and Teach Course” step write down the end date—the date you need to have everything done. If you traditionally develop class outlines a week before you need them, then use the date you need to have the FIRST class outline created (maybe give yourself a 1 or 2 week buffer between the first day of class and this end date).

2. Next to each of the other steps (except “Evaluate course”) write down how long you think you will need to complete that step (indicate any vacations, planned time off, etc.).

3. Using the end date, work backwards putting dates next to each step.

**Resources**
Scholarship of Teaching & Learning (SoTL)
(http://www.itap.purdue.edu/learning/cdm/sotl/process.html)

What is the Scholarship of Teaching and Learning (SoTL)?
SoTL is the systematic study of teaching and learning, promoting teaching as a scholarly endeavor. SoTL research is based upon theory or prior research, clear research questions and hypotheses, and appropriate methodologies. "SOTL is scholarly inquiry into student learning which advances the practice of teaching by making research findings public" (Wikipedia, 2014).

SoTL also shares established criteria of scholarship in general. This is made public, where the processes and outcomes - the work - can be reviewed by peers and judged to have merit and significance in the field of interest. The criteria can be built upon, replicated, and elaborated on by others in order to advance the field of study. A goal of SoTL is to contribute to the literature.

The focus of SoTL is on the creation of a product regardless of discipline. The emphasis is on learning outcomes and product.

- Kreber (2001). “Those who practice SoTL carefully design ways to examine, interpret, and share learning about teaching. Thereby, they contribute to the scholarly community of their discipline. In classroom research is important but is not sufficient for the scholarship of teaching and learning”. (p. 15)
- Huber & Hutchins (2005). “The core of SoTL work includes the kinds of inquiry and investigations that faculty are most likely to undertake when they examine and document teaching and learning in their classrooms in order to improve their practice and make it available to peers”. (p. 4)
- The Scholarship of Teaching and Learning involves integrating the experience of teaching with the scholarship of research and producing a scholarly product out of those activities.

Connection to Course Design
Course design is done with a purpose. Typically, this is to improve student learning based on course goals. SoTL can 1) help the instructor determine if the course design is supporting student learning, 2) determine which aspects of the design are supportive, 3) determine which areas might benefit from changes and 4) inform other instructors of the outcomes of the design.

To accomplish this, the instructor can take several steps throughout the design process. This section describes the types of steps an instructor can take and the supports available at Purdue to help the instructor with SoTL.

Possible Value and Benefits of SoTL
Each of the following values need to be evaluated inside each academic department to determine if the activity falls within the priorities of the department, university, and discipline:

- Evidence for excellence in teaching and learning
- Provide evidence of teaching effectiveness in tenure and promotion portfolios
• **Recognition** in promotion and tenure guidelines

*In addition, SoTL can:*

• Add to faculty accomplishments
• Become involved in a national/international higher education initiative
• Provide an addition to traditional scholarship in the field
• Help with classroom and program assessments
• Provide evidence in program review and accreditation
• Broaden graduate student training and preparation as future faculty
• Revitalize faculty members/provide new career focus
• Provide research opportunities for students

**Examples of SoTL projects**

• Projects examining students motivation and engagement
• Projects comparing the effectiveness of different modalities such as hybrid and face-to-face traditional formats.
• Projects comparing a face-to-face traditional section to a Service-Learning section
• Projects comparing student learning and engagement when technology tools are used such as clickers

**Student Level Outcomes**

Examples of student level outcomes to consider as you redesign your course could be:

• **Motivation** -- Move students into actively learning.
• **Engagement** -- Have students actively participate during class.
• **Competence** -- Students have a proper understanding of the material being given in class.
• **Performance** -- Students fare better in their academics in the class.
• **Retention** -- Students remember the information taught, and hold that information for a long time.

**What are the steps in SoTL?**

1. Write your research question/assessment design
2. Refine your question
3. Determine how to assess the question or problem of interest. Consider the Following:
   • Research Design
   • Timeline
   • Instruments
   • Analysis
   • Dissemination of results

**Measurements of effectiveness**

For IMPACT at Purdue, we support faculty in measuring the effectiveness of the redesign effort. For a list of the assessment techniques we use, see [IMPACT assessment techniques](#).
For a visual flowchart showing the types of SoTL, based on your starting point, see [SoTL – Is it working?](#).
(If you would like to discuss the flowchart, please contact Purdue CIE).

**Resources**

- CIE
- The [IMPACT program](#)
The ICD Process
(http://www.itap.purdue.edu/learning/cdm/process.html)

Circular Design

The ICD model provides recommended steps an instructor can take when developing or redesigning a course. The design is circular because many instructors find that they are continually changing their course. Although a redesign may start as a major project, additional changes may be made as some approaches are tried and refined, additional activities are added, technologies provide new methods, etc.
Four Major Steps

Typically, this involves answering four key questions. Each of these includes multiple steps in the model.

1. "Where are you starting?" this step helps you identify your learners and course constraints. This can be as simple as identifying accreditation requirements or more comprehensive by including learning style inventories in your course.

2. “What do you want to accomplish?” includes identifying goals for the course (which may be already identified by accreditation or other requirements), then identifying the learning outcomes – the overarching goals – for what students will accomplish in the course. These outcomes are then broken down into learning objectives. The ICD model is based on the principle of ‘backwards design’ – knowing where you want to end up before you start out.

3. “How do you want to approach it?” begins with identifying the type of course. The learning model provides an overall approach to the type of class that you will be leading – problem-based, online, classroom experiential, blended, flipped, etc. which informs the development of individual class outlines. At this point, you can work on creating your instruments to measure student learning (exams, assignments, activities, etc.). By creating these instruments, you tie the focus of the assessments to the key topics for the course. These rely on Bloom’s Taxonomies to ensure that the focus of the measurement instruments and the learner experiences are aligned with the appropriate taxonomic dimension. In addition, you can identify contingency plans to manage unexpected changes such as unavailable rooms or technologies, a major change in enrollment, etc.

4. “What methods and activities will you use to get there?” involves developing the detailed instruction followed by evaluation of progress. When developing instruction, instructors create specific and detailed class outlines that support their broad learning outcomes. Here you will identify activities, develop case studies, create videos, etc. A key step in course design is self-reflection – learning from your experiences as an instructor – so you can grow and develop. The last step in the overall model is to evaluate your instruction, which includes reviewing student feedback, your self-reflection, and student success in achieving learning outcomes. Such evaluation ideally contributes to revised learning outcomes and ongoing course modification to incorporate your new perspective.

Interactive Steps

Central to the interactive design model is the series of inner arrows. These indicate that even though for the most part you will be going around the circle, you may identify something in one step that affects another step.

For example, selection of the design model may mean you want to include additional information in the syllabus (created in the Sequence step) and development of the assessments might also lead to syllabus changes. When creating the learning outcomes you might identify some great ideas for class sessions that you don’t want to forget, so you may jump to that step to take note of them. (For this reason, you may want to create some filing system where each step in the model has a section.)
Where Are You Starting?
(http://www.itap.purdue.edu/learning/cdm/starting1.html)

1. Review Prerequisite & Subsequent Courses

Outcomes
To identify what students should be able to do after completing your course – your course outcomes.

Overview
Many courses are prerequisites for others. If students in your course are required to take a prerequisite, then you probably have expectations of what skills and knowledge they have before entering your course. Similarly, if you are teaching a prerequisite course, then the subsequent course may have expectations of what your students learn.

The content of your course is based on the overall curricular goals for each program. As such, it includes your course and any courses students must have already taken (including from secondary school) that lead you to believe they have a set of knowledge entering your course. Moreover, your course may meet some of the core curriculum goals for the campus, again establishing expectations from the rest of the curriculum. As your course is likely part of a curriculum, this step will identify what your students must learn to be successful in the next course(s).

Actions
1. Consider the courses students will already have taken before entering yours.
   - Does your course have stated prerequisites? If yes, what are they? **Purdue instructors:** If you are uncertain, you can find course attributes at [https://wl.mypurdue.purdue.edu/](https://wl.mypurdue.purdue.edu/).
   - What knowledge/skills can you assume they already have?
   - What knowledge/skills can you assume you may need to revisit?
2. Look at the post-requisite course(s) that require your course as their prerequisite.
   - What knowledge/skills do later courses assume that students will learn here? Unfortunately, it may be more difficult to identify a post-requisite course. Start by talking your department head.
     **Suggestion:** If you have not discussed your outcomes with the instructors teaching the pre- or post-requisites recently, you may find it helpful to ensure that you agree about the expectations of your class.
   - Faculty member Gary McFall, from Purdue's department of Computer Science, talks about how he determined what content to include in his CS 235 class by exploring the pre- and post-requisites for the course:

   Video 6:14
3. Identify any external requirements such as accreditation or licensure.
   • Which of these should be included in your course?
   • What, if any, are the implications on course content, approach, design, etc.?
4. Review the Core Curriculum learning outcomes identified for your course/program. Which of these could be included in your course?
5. If you have an assigned textbook, what are the topics in this that you must cover? Does your text identify learning outcomes & objectives?
6. Brainstorm on what else students should know, understand or be able to do upon successfully completing this course.

Resources
• Syllabi for pre-reqs and for post-reqs – ask other course instructors for a copy of their syllabi
• CIE-suggested syllabus format - http://www.purdue.edu/cie/toolsservices/syllabus.html
• Core Curriculum (http://www.purdue.edu/provost/initiatives/curriculum/)
• Program/curriculum guides
• Accreditation requirements
2. Identify Student Learning Characteristics
(http://www.itap.purdue.edu/learning/cdm/starting2.html)

Outcomes
1. Understand your students and how they have differing needs,
2. Appreciate student motivation

Overview
If we are interested in student-centered learning, we must understand our students. This step in the ICD process is to identify the main types of learners you will be teaching. This becomes important as you progress through your redesign when you identify learning outcomes, objectives, and activities that appeal and work with various students.

Learner characteristics define the ‘typical’ student groups. This can inform faculty about student learning preferences.

Some characteristics are easy to identify such as international students, older than average students, etc. What is more difficult is to identify how these may influence the students’ learning. For example, cultural differences may influence student involvement in a class, generational differences may influence reliance on technologies for learning and research, new university students may have a different mindset than seniors on responsibilities of faculty and students for learning, etc.

Understanding some of these differences can help you identify methods that may support student growth not just in learning your subject, but in becoming critical, life-long learners. One quick example: Many international students like video-taped lectures so they can repeat sections to understand what the lecturer is saying, helping them overcome language barriers.

Differences can be defined many ways - in the references section are a few, focusing on:

1. learning styles
2. demographic differences & student epistemological development
3. student motivation
4. the changing student

Learning styles inventories
A search on ‘learning styles inventories’ will get almost 1,000,000 hits. This makes it difficult to generalize or select a “best” inventory because they measure very different things. E.g., Fleming’s VARK model focuses on aural, read/write, kinesthetic, and visual, as opposed to McCarthy’s 4Mat model which includes knowing why, what, when, and what if.

Some research has concluded that many learning styles inventories are not valid and reliable (for example, see “A Systematic and Critical Review of Learning Styles”). Other research has shown that particular learning style inventories are sound (for examples, see the research pages for any learning style inventory such as Kolb’s Research Library).

The purpose behind using a learning styles inventory is to help you and your students 1) identify that people learn differently, 2) identify your personal strong styles, and 3) support you and your students in
strengthening their ability to learn using different styles. As an instructor, you have responsibilities for supporting varying learning styles. To keep all these types of learners engaged, you may need to incorporate a variety of types of learning activities. This will also support students in strengthening their ability to learn in different styles.

See the resource section below for information about learning styles.

**Demographic differences**

Some demographic differences are more obvious than others such as age and gender. However, demographic differences also include socio-economic and cultural differences. These are often more difficult to observe and appreciate.

You may also want to review the [Purdue University Global Learning Faculty Tips](http://www.purdue.edu/cie/teachingtips/overview.html) guide to help you work with International students. More resources below can also help with global learning.

If your students are having difficulty using instructional technologies, you may want to read this blog: [Technology: What Students know vs. what we want them to know](http://www.purdue.edu/cie/teachingtips/overview.html)

**Student motivation**

In their ARCS model, Keller and Ryan identified four features in student motivation. This image summarizes their findings:

For a written (rather than image) version of the ARCS model, see Student motivation: Keller’s ARCS Model

For more information on ARCS, see the [Purdue CIE webpage: Motivating Your Students](http://www.purdue.edu/cie/teachingtips/motivating_students/index.html), available at [http://www.purdue.edu/cie/teachingtips/motivating_students/index.html](http://www.purdue.edu/cie/teachingtips/motivating_students/index.html)
And here are some videos:

![Video 1](image1.png)  ![Video 2](image2.png)

**How Students Learn and Student Motivation, Part 1** (11:19 min)  **How Students Learn and Student Motivation, Part 2** (16:36)

This brief article discusses student motivation for cheating:

**The changing student**

Perry (professor of education at the Harvard Graduate School of Education) theorized that students change intellectually and ethically during college. This video by Constance Harris discusses his stages:

![Video](image3.png)

**Video:** 6:03

This brief article by Zull (Professor of Biology and Director of the University Center for Innovation in Teaching and Education at Case Western Reserve University) discusses brain research and its impact on teaching and learning (his book is available in Purdue Libraries):


**Actions**

1. Find out your historic student demographics. Purdue instructors: Ask your department head for the name of your Cognos manager. This person can run the DEMO report on student demographics for your course for the last several years, providing demographic information such as age, gender, residency, and major
2. Review the demographics report to identify any trends/changes – for example, changes in numbers of international students or older students.

3. Answer some of the following questions:
   - What is the distribution of colleges or majors for your students?
   - Do you have students from a variety of backgrounds, or are they a cohort from a particular major?
   - Might students from different programs have different learning styles, and how can you address these things?
   - How do individual characteristics (age, ethnicity, residency, sex) affect the dynamics of your classroom?
   - Are examples, activities and assignments geared toward a specific demographic or category of students?

4. Reflect on the level of your course
   - Will most of your students be first-year?
   - Will many of your students be from another culture?

5. Based upon your reflections, what kinds of learners can you expect to have?

6. Identify changes that you may need to make in your course to resolve the difference in either course activities or your expectations.

7. Consider providing a learning styles questionnaire to your students – but only if you can plan to incorporate learning activities that will respond to these – the Center for Instructional Excellence can help you with this. Many learning styles inventories also have support pages for different types of learners.

A learning styles inventory can also be used to talk with students about the importance of improving their skills at learning in a variety of styles.

**Learning Style Resources**

- Learning styles inventories links
- Purdue CIE
- Inventories list - links to 10 different inventories - [http://www.outohiou.edu/fd/learning_style_inventories.htm](http://www.outohiou.edu/fd/learning_style_inventories.htm)

**Demographic Differences Resources**

- Cognos reports on demographics
- Purdue’s Global Learning Faculty Development Program
• Harris, C. (8/20/2012). International Students’ Approach to Learning, available at Intl_Students_Approaches_to_Learning.pdf
What Do You Want To Accomplish?

3. Identify Learning Outcomes
(http://www.itap.purdue.edu/learning/cdm/accomplish1.html)

Outcomes
Completing these steps will provide you with a sequencing of lessons, objectives for each of your outcomes and the beginning of your syllabus. You will also identify levels of thinking, skills and attitudes you expect from successful students.

Overview
Although you may not always formally articulate your learning outcomes, doing so will enable you to more effectively develop the sequence of instruction, assessment instruments, learning model, and instruction for your course. Learning outcomes should not be focused on what content you need to cover, but instead on what the students need to learn.

Definitions
Learning Outcomes or Learning Objectives? Unfortunately, the definitions for learning outcomes and learning objectives are not universal across universities or even within a campus. Moreover, your accrediting agency may use them differently as well! The following definitions describe how these terms are used in ICD. Our usage is consistent with the approach used in the new core curriculum at Purdue.

Learning outcomes refer to the large or overarching goals you have for your course. Within the course design model we will give examples and will discuss the learning outcomes in detail.

Learning objectives – Within course redesign we use this term to mean the more concrete or specific goals which make up a learning outcome. So, for each learning outcome, you likely will have several learning objectives. We cover these in the Structure Course Components step.

A bit of theory: Taxonomies
Bloom’s Cognitive Domain Taxonomy and the Psychomotor and Affective Domain Taxonomies are very useful in helping identify the categories of learning needed. These taxonomies provide an easy way to understand hierarchy of skills.

- Cognitive Domain – mental skills – ranging from understanding and applying concepts.
- Psychomotor Domain – manual and physical skills – ranging from observing to adapting.
- Affective Domain – attitudes and behaviors – ranging from receiving to acting based on values.

For a copy of the domains, with examples and verbs, see Taxonomies/Domains of Learning
Dr. Bill provides examples of alignment...

Bill, P. (2013). “Using Bloom’s Taxonomy to clarify where your instruction is going” Purdue College of Veterinary Medicine. (19 mins)

Higher-order thinking skills are compared to lower-order thinking skills...

Kruse, S. (2013). “HOTS vs LOTS” Purdue ITaP. (3 mins)

Other taxonomies...

Reid, P. (2012). “’Taxonomies’ is plural” Purdue ITaP. (2mins)

You may also want to read the following:


**Why the focus on Taxonomies?**
- Taxonomies give guidance on writing outcomes, objectives, assessments, and class outlines.
- The taxonomies provide instructors with a theoretical framework for determining the levels within each domain that they want students to attain.
- The taxonomies and accompanying levels and verbs help instructors ensure that they have a congruency among the objectives, assessments, activities, and class outlines.
Developing Outcomes
The following videos provide support in developing learning outcomes and objectives:

- Introduction to Learning Outcomes, Part 1 (1:47)
- Learning Outcomes, Part 2 (5:19)

A larger copy of the version of Bloom's Taxonomy that Dave uses is available - [Bloom's Taxonomy as a Wheel](#).

Outcomes Examples
For the purposes of course design, we define a learning outcome as an overarching goal.

Dr. Frank Dooley’s AGEC 20300 course includes the following three learning outcomes:
1. Master the language (jargon and terminology) of economics.
2. Be able to create, interpret, and understand key economic graphs.
3. Develop an understanding of economic theory, especially price and output determination, elasticity, cost theory, and production theory.

And Gary McFall’s CS 25300 course includes the following learning outcomes:
1. Students will be able to develop a comprehensive report that answers specific business questions.
2. Students will be able to convert data into information in response to specific queries.
3. Students will be able to extract a subset of relevant data from large data sets.

See Samples of Learning Outcomes other examples from Purdue (available as images only).

Tie to the core curriculum
If your course is part of the core curriculum, then it must teach students in the course the content or abilities defined by one or more of the core outcomes. At the foundational level there are five core outcomes. The Science, Technology and Mathematics, and the Human Cultures outcomes are further delineated and students must take multiple courses to address each outcome. Definitions and criteria related to each core outcome are available in an Appendix (see Resources below) that accompanied the document outlining the core curriculum approved by Purdue’s University Senate.

If you are redesigning a core course, the learning outcomes, assessment instruments, and learning activities must reflect the requirements of the specific core outcome(s) in addition to content or other abilities you intend for students to learn.

Purdue’s core curriculum also consists of embedded outcomes that are met by courses or co-curricular activities within a major. In addition to courses or activities that aim to develop students’ information
literacy, written communication and oral communication at higher levels than the foundational core, these courses can include a number of other outcomes: critical thinking, ethical reasoning, global citizenship and social awareness, intercultural knowledge, leadership and teamwork, quantitative reasoning, and integrative knowledge.

In part, the core curriculum outcomes were derived from the Association of American Colleges and Universities’ (AACU) Value Rubrics. Even if your course is not part of Purdue’s core, the criteria provided for a specific core outcome can be useful in determining learning outcomes and objectives for your course.

For more on Purdue’s Core Curriculum, please see: Undergraduate Outcomes-based Core curriculum webpages.

**When to use Taxonomies**

*When can you use taxonomies in course design?*

[Horton, A. (2013) Video](#)
Actions
Write clear learning outcomes for your course:

1. Consider cognitive, affective and psychomotor skills (these are detailed in Taxonomies/Domains of Learning).
2. Using the taxonomies, identify which dimensions of learning that students should have at the end of your course.
3. Write the 4-5 learning outcomes that define the overarching goals of your course. (Your textbooks or accrediting agencies may have learning outcomes that you feel are appropriate).
4. Map your outcomes to the taxonomies – (Learning Outcome Maps – Word version.) (this map can be used later when developing assessments and class outlines).
5. Review your map to confirm that you are meeting the levels of the taxonomy(ies) that you want.
6. Share your learning outcomes with the faculty from pre- and post-requisite courses. Their insights can help you validate your learning outcomes.

Completing the assessment map
Sample & blank maps in Word: Learning Outcome Maps
The map is a grid showing down the side the outcomes and matching objectives.
1. Across the top write the levels of Bloom’s Taxonomy (and/or other taxonomies you have identified as appropriate).
2. Down column A add your objectives.
3. In the grid, make an ‘X’ to indicate which level of the taxonomy matches the objective.

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Of course, you might find other formats better for you and some instructors might not want to create a grid, but just note the level next to the objective. (However, later you might find the grid useful for assessments and class outlining):
Defining learning outcomes and how to write them...

Taxonomies Resources
4. Structure Course Components
(http://www.itap.purdue.edu/learning/cdm/accomplish2.html)

Outcomes
The results of this step will be:
- Sequencing of lessons
- Objectives for your outcomes
- The beginning of your syllabus

Overview
You may find that your learning outcomes build upon each another – that is, some sequencing may present itself. For example:

Sequencing
Frank Dooley’s AGEC 20300 course includes the following three learning outcomes (among others):

3. Master the language (jargon and terminology) of economics.
4. Be able to create, interpret, and understand key economic graphs.
5. Develop an understanding of economic theory, especially price and output determination, elasticity, cost theory, and production theory.

It would be difficult for students to complete number 4 without first completing number 3. In turn, number 5 is dependent on number 4.

In other instances, however, you may find that the sequence is less obvious, and so you may want to consider some other rationale for sequencing outcomes. For example, going from a general concept of the components of something before building a comprehension of that topic might be an option. But reversing the sequence to develop comprehension and then analyze the components might also work.

Objectives
An important part to successful teaching is identifying the specific learning objectives for each class period or topic. These are based on the learning outcomes. While a learning outcome is a general goal, learning objectives are specific.

Outcomes are high-level. Each outcome will have objectives – lower-level goals.

According to Mager:

- An objective is a description of a performance you want learners to be able to exhibit before you consider them competent.
- An objective describes an intended result of instruction, rather than the process of instruction itself.

These are often worded as “By the end of this section, the student will be able to...” and they are specific.
Examples
from Frank Dooley’s AGEC 20300 course:

Outcome:
Master the language (jargon and terminology) of economics.

Objectives:
1. Describe the “economic way of thinking” including definitions of utility, opportunity costs, marginal costs, marginal benefits, and how these concepts may be used in decision-making.
2. Other-things-equal assumption or ceteris paribus.
3. Be able to distinguish macro versus microeconomics.
4. What is the difference between positive and normative economics and their importance to policy work?
5. Identify the four types of economic resources and types of income associated with each.

Developing objectives
Research indicates that objectives that are clear and precise are most helpful to both the instructor and students (Mager, 1962). The following are guidelines developed based on Mager:

- **Performance**: The objective should describe what the participant should be able to do; also referred to as *behavior*.
- **Condition**: The objective should describe under what constraints the participant’s performance occurs.
- **Criterion**: The objective should determine at what point the performance is acceptable; it describes the standards that must be met.

How to write objectives
1. Check the taxonomies for the appropriate level of the objective
2. From the taxonomies, select an appropriate verb
3. Start each objective with "By the end of this unit/course/session, the student will be able to..."
4. Describe the performance such as "compare the rate of evaporation of..." or "demonstrate appropriate use of..."
5. Describe in detail the conditions such as "within the lab environment" - you may have several conditions
6. Describe any criterion - your measures of success such as "in less than 5 minutes" - you may use a rubric as your criterion

Need help writing objectives?
This website has a tutorial: Instructional design/Learning objectives, Wikiversity (2014). Available at: [http://en.wikiversity.org/wiki/Instructional_design/Learning_objectives](http://en.wikiversity.org/wiki/Instructional_design/Learning_objectives)

Actions
(Remember that the course design process is circular and what you develop here does not have to be the final version. At first glance, this list looks a bit long, but in reality, you are probably already doing all these things mentally each time you develop a syllabus.)

1. Review your outcomes to determine if a natural sequence presents itself.
2. Identify the objectives for each outcome, or if you prefer, ‘topic of instruction’.
3. Identify what cognitive, affective and/or psychomotor skills the students will need to achieve in order to meet each objective. This may lead to developing additional objectives.
4. Identify if students need to refresh their knowledge of prerequisite learning before learning each objective. This may lead to developing additional objectives.
5. Sequence the skills and knowledge to ensure that pre-requisite skills are provided first, similar skills and knowledge are covered close together, etc.
6. Review any textbooks and handouts to identify how they tie to the learning outcomes or objectives. This is a good time to also ensure that you have appropriate readings for each.
7. If your textbook includes exercises appropriate for your students, take note of them for potentially including in your assessments. If you identify exercises that will not be assessed, be sure to indicate in your syllabus that these are expected but not graded.
8. Work with your departmental librarian to identify library resources you would like to include. (Contact the library to ensure they are readily available!)
9. Develop a syllabus using the prescribed format (NOTE: you will need to come back to the syllabus as you progress through the course development to add material later identified). At this stage, you can develop the following parts of the syllabus:
   - learning outcomes and objectives
   - assessment dates
   - Student support material (how to excel within an active learning model, team work, etc.)
   - textbooks, library resources

Resources
- Free online ‘lessons’ in writing objectives: http://en.wikiversity.org/wiki/ID_learning_objectives
- Purdue’s Syllabus template
How Do You Want To Approach It?

5. Identify Learning Model
(http://www.itap.purdue.edu/learning/cdm/approach1.html)

Outcome
At the end of this section, you will have identified the high-level approach(s) to the course.

Overview
Identifying your approach will determine the assessments, class outlines, evaluations... in fact everything about your course. This is similar to developing a vision of a house. With a house, the vision influences the blueprint which then influences the building process. In course design, the approach is going to influence the assessments and then the actual course outlines.

Note: the following definition used in this section: NCAT (National Center for Academic Transformation) / academic course transformation learning models – these learning models describe the format for how an instructor leads a class and includes models such as online, classroom, blended, and other types.

Although many instructors are most comfortable with a lecture-based method of teaching, research shows that this is not usually the most effective learning method for students (for example, see Prince, 2004).

Teaching in a student-centered way that emphasizes active learning involves selecting different approaches and techniques to engage your students. The approaches and techniques you select will also have implications for how your students learn course material. As you design your course, you should consider what kinds of things you want students to be doing, e.g., solving problems, analyzing cases, using information, thinking critically, collaborating with teammates, etc. in the active learning environment you set up. Essentially there are two questions to consider when designing your course to have students learn actively:

- What are approaches or techniques that will enable the students to learn/use course content in the ways you intend?
- Are there academic or discipline-specific practices or skills you want your students to encounter that relate to the subject of the course?

Watch this video about the connection between student success and student-centeredness:

Levesque-Bristol, C. Transformative Designs... Other transformations for active learning. Video: 8:51
The active learning activities you select to engage your students may help them develop a skill or ability, e.g., critical thinking, problem solving, using information, etc. While a skill and ability your students learn in your active learning classroom may simply be a means to end, i.e., helping the students to learn content, they may also be part of the learning gains you intend for students in the course. In the latter case, the skill or ability you want your students to learn through the course should be reflected in one or more of the learning outcomes you develop for the course.

Transformative pedagogies and designs
As part of the Purdue IMPACT project, we have faculty members who have moved to problem-based, fully online, supplemental, replacement, flip and other models (See Common approaches). Rather than select a model and force your course into the model, we suggest an approach where you consider the types of components you would like to include and how you will offer them. Although you may find that you fit nicely into an already-defined model, you may find you are using elements of several.

However, understanding that you may want to review the commonly used models, you will find information about each in the resources section below, and you will find an alternative action plan for selecting a specific model (See Common approaches to jump to this section below).

For Purdue’s IMPACT program, we have differentiated between transformative pedagogies and transformative designs.

- **Transformative pedagogies** include team-based learning, problem-based learning, and case-based learning which can be used as predominant pedagogies for an entire course. Used in this way they all will directly impact the instructor/student roles, creating a very student-centered active learning environment.

- **Transformative designs**, however, speak to the modes used for teaching and learning. These include all the NCAT models as well as flipped and other models which provide the format.

A transformative pedagogy will also employ a transformative design. However, many instructors prefer a transformative design and use of a wide variety of pedagogies. Within a transformative design, instructors may adopt a wide variety of active learning techniques and pedagogies.
At least six transformative design models are available that include a variety of technologies, course designs, and student interactions. Selecting a model (or a combination of models) will guide you in lesson planning for learning. This will also help you identify overarching process goals for your course (such as “I would like to ensure my students have a safe place to discuss topics”, “I want my students to be excited about the subject” or “I need my students to have a safe environment and understand the potential dangers involved in the lab”).

The iterative process
Selection of your transformative pedagogy and design may impact your ability to quickly change your course. Many faculty find that they need to slowly move from their current design to their new design. For example, one faculty member wanted to move to a flipped model but was unable to book an active learning classroom for the first semester. Another realized that a buffet model was her end goal, but building all the choices required several semesters. This should not stop you from adopting your selection, but you may want to make intermediary plans.

Actions for identifying your own unique approach
1. Determine how you want your students to learn about course content as active learners in your redesigned course.
   - Are there particular ways you want students to apply subject content, e.g., to solve problems, understand how the content relates to the “big picture,” etc.?
   - Are there specific abilities you want you students to develop, e.g., interpersonal skills, problem solving, etc.?
2. Explore one or more of the active learning pedagogies listed above (or ones you that identify independently), and determine if it will enable the kind of learning you want for your students. If you want to use a transformative pedagogy, write on a sticky note which one.
   - Team-based learning
   - Problem-based learning
   - Case-based learning
   - Other (define this)
3. Consider what other types of components you want in your course
   - Uninterrupted lecture
   - Active learning within lecture
   - Video lectures online
   - Activity-based learning
   - Supplemental materials
   - Tutorials & diagnostics
   - Individual or group work with Instructor/TA personal assistance available
   - Team work
   - Others (define these)
4. Write each component you plan on using on a sticky note (you are not committing to using these - they are just ideas)
5. For each sticky note, write whether it is:
   - optional or mandatory
   - during class time or out-of-class
   - online, classroom-based, combination (component is sometimes online, sometimes classroom) or both (component is offered in both classroom and online format)
6. Map these onto the transformation models guide - available here: Common Transformation Models
7. Determine if you want to change any of your components or approaches based on this.
8. Identify any space or equipment you will need that is not normally provided
   - Active learning (IMPACT) room (what's available)
   - Computer equipment (what's in the classrooms)
   - Smartboards
   - Special student equipment not normally provided (computers, white boards, i>clickers...)
   - Presentation systems
   - Special technologies
   - Videotaping equipment
   - Special classroom layout (lecture hall, movable student tables, etc.)
   - Etc.
9. Identify what equipment will be readily available based on department resources, ITaP resources, and the room assigned (list of TIC sites). You may also be able to request another room.
10. Identify contingency plans – for example, if you want to move to a supplemental model in fall but don't have all the resources ready in time, or you want to move to a flipped style but will not have access to an active learning room, what will you do?
11. Remember that you can modify your approach as you progress, if you identify new possibilities

**Actions for identifying a common model to fit your needs**

1. Compare your learning outcomes to the models (Common Transformation Models) to determine if particular models are more applicable than others. See the resources below for links to further information about each model.
2. Identify a model you think will fit best for you and at least one additional model that might work.
3. Complete the Models Worksheet.doc for each to identify how this will be applied to your course.
4. Identify any equipment you will need that is not normally provided
   - Active learning (IMPACT) room (what's available)
   - Computer equipment (what's in the classrooms)
   - Smartboards
   - Special student equipment not normally provided (computers, white boards, i>clickers...)
   - Presentation systems
   - Special technologies
   - Videotaping equipment
   - Special classroom layout (lecture hall, movable student tables, etc.)
   - Etc.
5. Identify what equipment will be readily available based on department resources, ITaP resources, and the room assigned (list of TIC sites). You may also be able to request another room.
6. Identify contingency plans – for example, if you want to move to a supplemental model in fall but don't have all the resources ready in time, or you want to move to a flipped style but will not have access to a flipped room, what will you do?
Resources

Common approaches
Models using a transformative pedagogy
- Problem-Based Learning (PBL)
- Case-Based Learning (CBL)
- Team-Based Learning (TBL)
Models which maintain traditional lecture
- Linked Workshop
- Supplemental Model
- Replacement Model
Models with an Online Focus
- Emporium Model
- Fully Online Model
Models with a combination of online & classroom
- Buffet Model
- HyFlex Model
- Flipped Model
- SCALE-UP Model
Models using transformative pedagogies

**Problem-Based Learning (PBL)**

After being presented with a problem by the instructor, students work in groups to brainstorm ideas, identify what they know about the problem, what they don’t know but must learn in order to solve the problem, develop an action plan for research, and discuss the topics and concepts researched, eventually coming to some agreement on the best resolution. PBL develops students’ abilities to define problems, research and evaluate information, and develop solutions to problems.

**Articles:**


**Examples of use:**


**Case-Based Learning (CBL)**

Cases are typically complex problems written to stimulate classroom discussion and collaborative analysis. CBL involves the interactive, student-centered exploration of realistic and specific situations. As students consider problems from a perspective which requires analysis, they strive to resolve questions that have no single right answer. Emphasizing the application of theory to practice, the use of contemporary cases can make subject matter more relevant.

**Articles:**

Case Studies:


Team-Based Learning (TBL)

Although many approaches utilize teams, TBL applies specific procedures for developing high performance learning teams. Larry Michaelsen developed a team-based learning approach that uses a specific sequence of individual work, group work, followed by immediate feedback. SCALE-UP (now called Student-Centered Active Learning Environment with Upside-down Pedagogies) is another model that leverages team learning. In a Scale-Up classroom, three teams sit at a round table and work on problems while the instructor circulates. TBL emphasizes problem solving and interpersonal skills.

Articles:


Case Studies:


Models which maintain traditional lecture

Linked Workshop

As defined by the National Center for Academic Transformation:

- Retains the basic structure of the college-level course, particularly the number of class meetings.
- Replaces the remedial/developmental course with just-in-time workshops.
- Workshops are designed to remove deficiencies in core course competencies.
- Workshops consist of computer-based instruction, small-group activities and test reviews to provide additional instruction on key concepts.
- Students are individually assigned software modules based on results of diagnostic assessments.
- Workshops are facilitated by students who have previously excelled in the core course and are trained and supervised by core course faculty.
- Workshop activities are just-in-time—i.e., designed so that students use the concepts during the next core course class session, which in turn helps them see the value of the workshops and motivates them to do the workshop activities.
Defining the linked model...
Watch Reid, P. (2012). “Linked Workshop Model in (about) a Minute.” Purdue ITaP. Available at: https://www.kaltura.com/index.php/kwidget/cache_st/1276896353/wid/983291/uiconf_id/6548391/entry_id/1_ahy6ehvy video: (1:13 mins)

- NCAT Write-up: http://www.thencat.org/PlanRes/R2R_Model_Linked.htm

Supplemental Model
As defined by the National Center for Academic Transformation:

The Supplemental Model:

- Retains the basic structure of the traditional course, particularly the number of class meetings.
- May simply supplement lectures and textbooks with technology-based, out-of-class activities to encourage greater student engagement with course content and to ensure that students are prepared when they come to class.
- May add technology-based, out-of-class activities and also change what goes on in the class by creating an active learning environment within a large lecture hall setting.

Resources
Defining the supplemental model...


- List of all NCAT Supplemental case studies: http://www.thencat.org/PCR/model_supp_all.htm
- Booklet on active learning techniques for the large class

Examples that Add Out-of-Class Activities and Do Not Change In-Class Activities

Example 1 - University of New Mexico: General Psychology
• Students use a two-disc CD-ROM—which contains interactive activities, simulations, and movies—to review and augment text material.
• Students receive credit for completing four online mastery quizzes each week and are encouraged to take the quizzes as many times as needed until they attain a perfect score. Only the highest scores count.

**Example 2 - Carnegie Mellon University: Introductory Statistics**

• An automated, intelligent tutoring system monitors students' work during lab exercises, providing feedback when students pursue an unproductive path, and closely tracking and assessing a student's acquisition of skills—in effect, providing an individual tutor for each student.

**Examples that Add Out-of-Class Activities and Change In-Class Activities**

**Example 1 - Spanish: University of Massachusetts-Amherst: Introductory Biology**

• Students review learning objectives, key concepts and supplemental material posted on the class Web site prior to class and complete online quizzes, which provide immediate feedback to students and data for instructors to assess student knowledge levels.
• During class, the instructors use a commercially available, interactive technology that compiles and displays students' responses to problem-solving activities.
• Class time is divided into ten- to fifteen-minute lecture segments followed by sessions in which students work in small groups applying concepts to solve problems posed by the instructors.
• Instructors reduce class time spent on topics the students clearly understand, increase time on problem areas, and target individual students for remedial help.

**Example 2 - English Composition: University of Colorado-Boulder: Introductory Astronomy**

• A 200-student class meets twice a week in an auditorium.
• The first meeting focuses on an instructor overview of the week's activities.
  • About a dozen discussion questions are posted on the Web.
  • Students meet for one hour in small learning teams of 10-15 students (supervised by undergraduate learning assistants) to prepare answers collaboratively and to carry out inquiry-based team projects.
  • Teams post written answers to all questions.
• At the second class meeting, the instructor leads a discussion session, directing questions to the learning teams.
  • The instructor has reviewed all posted answers prior to class and devotes class time to questions with dissonant answers among teams.

**Replacement Model**

As defined by the National Center for Academic Transformation:

• reduces the number of in-class meetings
• AND replaces some in-class time with out-of-class, online, interactive learning activities
• OR also makes significant changes in remaining in-class meetings.
Resources

Defining the replacement model...
video: (1min)

- Page of links to case studies: http://www.thencat.org/PCR/model_replace_all.htm
- Case study 1: http://www.thencat.org/PCR/R1/PSU/PSU_Overview.htm
- Case study 3: http://www.thencat.org/PCR/R3/PoSU/PoSU_Overview.htm

Examples that Substitute Out-of-Class Activities for Some In-Class Time and Do Not Change In-Class Activities

Example 1 - Penn State University: Elementary Statistics

- Reduce lectures from 3 to 1 per week (keeping 1 lecture the same) and change 2 recitation sections to 2 computer-studio labs, where students work individually and collaboratively on computer-based activities.
- Students are tested on assigned readings and homework using Readiness Assessment Tests (RATs) 5-7 times during the term for 30% of their grade.
- Students prepare outside of class by reading the textbook, completing assignments, and using Web-based resources. Students take the tests individually and then immediately in groups of four.
- RATs motivate students to keep on top of the course material and enable faculty to detect areas in which students are not grasping the concepts.

Example 2 - University of Wisconsin-Madison: General Chemistry

- Reduce lectures from 2 to 1 per week (keeping 1 lecture the same) and reduce discussion sessions from 2 to 1 per week.
- Substitute Web-based tutorial modules that lead students through a topic in 6 to 10 interactive pages.
- Then, a debriefing section includes questions that test whether the student has mastered the content.
- Diagnostic feedback points out why an incorrect response is not appropriate.
- Students can link directly from a difficult problem to additional tutorials that help them learn the concepts.

Examples that Substitute Out-of-Class Activities for Some In-Class Time and Change In-Class Activities

Example 1 - Spanish: University of Tennessee–Knoxville: Intermediate Spanish Transition

- Reduce class-meeting times from 3 to 2 per week.
- Move grammar instruction, practice exercises, testing, writing, and small-group activities focused on oral communication to the online environment.
INTERACTIVE COURSE RE/DESIGN

- Use in-class time for developing and practicing oral communication skills.

**Example 2 - English Composition:** Tallahassee Community College: College Composition

- Reduce class-meeting times from 3 to 1 per week and substitute 2 workshops.
- Use online resources to provide diagnostic assessments resulting in individualized learning plans; interactive tutorials in grammar, mechanics, reading comprehension, and basic research skills; and discussion boards to facilitate the development of learning communities.
- Use in-class time to work on writing activities.

**Models with an Online Focus**

**Emporium Model -**

The emporium model replaces lectures with a learning resource center model featuring interactive computer software and on-demand personalized assistance.

- Eliminates all lectures and replaces them with a learning resource center model featuring interactive software and on-demand personalized assistance.
- Depends heavily on instructional software, including interactive tutorials, practice exercises, solutions to frequently asked questions, and online quizzes and tests.
- Allows students to choose what types of learning materials to use depending on their needs, and how quickly to work through the materials.
- Uses a staffing model that combines faculty, GTAs, peer tutors and others who respond directly to students’ specific needs and direct them to resources from which they can learn.
- May require a significant commitment of space and equipment.
- More than one course can be taught in an emporium, thus leveraging the initial investment.

**Resources**

*Defining the emporium model...*


video: (1min)

Watch: Kent State. (2011). "What students are saying about the Math Emporium." Kent State University. Available at: [http://www.youtube.com/watch?v=7OqBcXLEEIQ](http://www.youtube.com/watch?v=7OqBcXLEEIQ)

video: (2:38)

- Short description and case studies: [http://www.thencat.org/PlanRes/R2R_Model_Emp.htm](http://www.thencat.org/PlanRes/R2R_Model_Emp.htm)
- How to Structure a math emporium: [http://www.thencat.org/R2R/AcadPrac/CM/MathEmpFAQ.htm](http://www.thencat.org/R2R/AcadPrac/CM/MathEmpFAQ.htm)
Fully Online Model -

Who benefits from Online Learning?

Defining the fully online model...


As mentioned above, the primary benefit to the student is one of convenience. When looking at the benefits to a student listed by different sources, you will consistently get answers that are within this list offered by Franklin University in Columbus, Ohio:

Top 10 Reasons for Learning Online

1. You can attend class anytime, anywhere you have Web access.
2. You can access course materials 24 hours a day, 7 days a week.
3. You can learn from instructors across the country and around the world, broadening your perspective.
4. You'll enhance your ability to communicate effectively through the latest technology.
5. You'll network with classmates from a wide range of backgrounds and locations.
6. You can access instructors immediately through chat, discussion thread, or email, without having to wait for office hours.
7. You'll have access to a broad spectrum of relevant content through your online course Web site.
8. You could earn higher grades because you can learn at your own pace.
9. You'll learn innovative strategies for virtual teamwork by using electronic communication to interact with a group. Employers highly value this skill.
10. You'll benefit from a flexible schedule, which is extremely helpful if you're balancing your education with work and family life.

What makes a good online course?

Given then that the effectiveness of online learning is tied to training and resources available to the instructor, what are the best practices to use in online learning? Research has shown that many are the same practices used in a face to face classroom, just slightly altered to fit the medium of delivery. While there are numerous sources of what the best practices are, a majority are very similar in framework. The Purdue Extended Campus has taken the “Rubric for Online Instruction” developed by Cal State-Chico (available at http://www.csuchico.edu/roi/documents/rubricpdf) and adapted it into a “Guide to Quality Online Instruction” that is used to evaluate course designs. The rubric breaks it down into 5 standard areas:

- Standard 1: Learner Support Resources
- Standard 2: Course Organization and Design
- Standard 3: Instructional Design, Interaction, & Communication
- Standard 4: Assessment & Evaluation of Learning
- Standard 5: Instructor Collection & Use of Learner Feedback

Link to list of case studies: http://www.thencat.org/PCR/model_emporium_all.htm
For details on these, visit the Cal State-Chico site above.

What is "Online Learning"?

The term is a combination of two words that most are familiar with. The first term, “online”, commonly refers to any activity taking place on the Internet or via interactive communications between a sender and a receiver of information. The second term, “learning”, is an activity or process that involves study, experience, practice, or being shown information with the goal of obtaining knowledge. The terms combined have become, with their synonym “e-learning”, a term for defining a form of education, either formal or informal, that takes place asynchronously using the Internet as its delivery medium.

Online learning has most of the same components of a traditional classroom, without the boundaries of time, space and proximity. The instructor and students can communicate and learn from any combination of time zones, locations and distances apart. The freedom of online learning is what is typically thought of first when discussing the benefits, which will be discussed later.

The Babson Survey Research Group defines online learning courses as “those in which at least 80 percent of the course content is delivered online. Face-to-face instruction includes courses in which zero to 29 percent of the content is delivered online; this category includes both traditional and web facilitated courses. The remaining alternative, blended (sometimes called hybrid) instruction has between 30 and 80 percent of the course content delivered online” (Allen & Seamen, 2011, pg. 7).

You may also hear online learning referred to as an ALN. This stands for an Asynchronous Learning Network, which combines the time and space of asynchronicity with gaining knowledge via a linked set of learners and instructors. ALN is a term less commonly used, but you will see it in many research articles on the subject.

A recent survey revealed that the number of post-secondary students in the United States taking at least one online education course “increased by over 570,000 to a new total of 6.7 million” (Allen & Seamen, 2013, pg. 4). When you look at that number in comparison with the number of overall students you find that “the proportion of all students taking at least one course online is at an all-time high of 32.0 percent” (Allen & Seamen, 2013, pg. 4).

Data on the availability of online learning is seeing an equal ramp up as well.” The number of institutions with no online has dropped to less half this value for 2012 (13.5% with no online offerings in 2012)” (Allen & Seamen, 2013, pg. 20). and the number that offers an entirely online degree program is up to “62.4% in 2012 as compared to 34.5% in 2002” (Allen & Seamen, 2013, pg. 20).

One of the terms you will undoubtedly come across these days when you discuss online learning is the term “MOOC.” MOOC is an acronym and stands for Massive Open Online Course. For the purposes of comparison, a MOOC is to online learning what an apple is to fruits. It is a type of online learning that differs from what is typically offered by higher education institutions by the larger number of students within the class (massive) and the lack of a cost to participate or use the course content (open). Beyond that, they share all the same aspects of any other online learning course and benefits from implementing the best practices that will be covered in this document.
Is there research on the effectiveness of Online Learning?

As online learning has increased in popularity and availability, numerous research studies have been done to determine its effectiveness. The Allen & Seamen data shows that the view of academic leaders when comparing online learning to traditional learning has improved over time. However, a sizable minority of around 23% still feel that it is “somewhat inferior or inferior” to traditional delivery (Allen & Seamen, 2013, pg. 24). What is also growing in popularity at academic institutions is the use of survey and assessment tools to monitor online courses and comparing the success or failure in meeting desired learning outcomes with those of their face to face classrooms. This is necessary so that the opinions voiced on the subject are not just developed from perceptions, but also data driven opinions.

The Sloan-C Consortium Report had this to say about the learning effectiveness of online learning:

“Is online learning effective? Are students receiving educations that represent the quality of the institutions they are attending? A thorough review of research conducted by Learning Effectiveness Effective Practices Editor Karen Swan, Associate Professor of Instructional Technology at the University of Albany, overwhelmingly supports the view that online learning can be just as good as, and – in some cases – better than, face-to-face, traditional learning.” (Lorenzo & Moore, 2002)

“Randy Garrison, Director of The Learning Commons at the University of Calgary, adds that online learning effectiveness requires that educators understand how to build online learning environments that generate meaningful discourse and encourage deep reflection, with significant opportunities for collaboration between student and faculty and student and student. He says that online courses create communities of inquiry where learning is accomplished through sustained electronic communications, often in the form of small group discussions that engage all “the dimensions for higher-order learning” (Lorenzo & Moore, 2002, pg. 5).

In a 2002 study by Charlotte Neuhauser at Madonna University, data was collected and compared on 2 sections of an identical course. One was delivered entirely online and the other was in a face to face setting. The class members were not pre-selected and among the data collected for review were test scores, final grades and course effectiveness. Her conclusion was this:

“The study compared two sections of the same course—one taught FTF and one taught online asynchronously. Even though this study did not preselect students, the demographics of age, work experience, and prior media knowledge showed no significant differences between the two groups. The retention rate of 84% was identical for the two groups; however, the attrition rate for the traditional student (18–22 years) was higher than that for the nontraditional student, especially in the online class. The results of this study support prior research findings that there is no significant difference in the major metrics—test scores, assignments, participation grades, and final grades; however, actual scores for the online group were slightly higher. Ninety-six percent of the online students found the course as or more effective to their learning than their typical FTF course, whereas 100% of the FTF students found this course as or more effective than their typical FTF course. There was no significant difference between the two groups in their assessment of the learning effectiveness of the course”(Neuhauser, 2002, pg. 110).

“Finally, considering the statistically insignificant differences between the two groups of students in demographics, learning styles and preferences, perceptions of course and task effectiveness, description of the course, and technical competencies, this study provides one more addition to the growing body of
literature that asserts the quality of online learning is as effective as FTF learning” (Neuhauser, 2002, pg. 112).

By contrast, in a 2013 study by Kelly Bergstrand and Scott V. Savage, it was concluded that in the Sociology courses in the study, students felt like they learned less in an online course. More importantly in this study were some of the reasons they had that perception. The students in the online course felt they were shown less respect and that their instructors were inferior. In analyzing their conclusion, they summarized that “as our findings suggest, some instructors may benefit from a move to online courses. Consequently, it is likely that online courses are not universally ‘superior’ or ‘inferior’ to traditional courses but depend on the training and resources provided by the institutions, as well as the decisions and teaching strategies of instructors. Thus, administrators and instructors at institutes of higher education should continue to strive to ensure that undergraduate students enrolled in online courses receive the same quality of education as their peers in traditional classroom environments” (Bergstrand & Savage, 2013, pg. 304).

Conclusion

The growth in market for and use of online learning makes it imperative that higher education institutions invest time and resources to properly prepare both the infrastructure and faculty pool for online delivery of academic knowledge. Many prominent institutions are already leveraging heavily in the potential of online learning and expanding their academic and financial revenue reach beyond the geographic boundaries they have previously controlled. By focusing on these best practices, along with researching and developing new ones, the online experience can continue to grow in terms of respect within the higher education and corporate communities and establish itself as a viable alternative to traditional education.

Resources on Online Learning Pedagogy

- The Sloan Consortium (Sloan-C) Effective Practices http://www.sloanconsortium.org/effective/
- EDUCAUSE http://www.educause.edu
- Blackboard Exemplary Course Project http://www.blackboard.com/Communities/Exemplary-Courses.aspx
- American Distance Education Consortium (ADEC) Guiding Principles for Distance Learning http://www.adec.edu/admin/papers/distance-learning_principles.html
- Innovations in Distance Education (IDE) http://www.worldcampus.psu.edu/AboutUs_MissionOverview.shtml
- Quality Matters (Maryland Online) http://www.qmprogram.org/
- Link to list of case studies: http://www.thencat.org/PCR/model_online_all.htm

Reference List


Models with a combination of online & classroom

**Buffet Model**

The buffet model customizes the learning environment for each student based on background, learning preference, and academic/professional goals and offers students an assortment of individualized paths to reach the same learning outcomes. This usually involves developing individualized learning contracts with students. According to NCAT, the buffet model has the following features:
• Customizes the learning environment for each student based on background, learning preference, and academic/professional goals.
• Requires an online assessment of student’s learning styles and study skills.
• Offers students an assortment of individualized paths to reach the same learning outcomes.
• Provides structure for students through an individualized learning contract which gives each student a detailed listing, module by module, of what needs to be accomplished, how this relates to the learning objectives, and when each part of the assignment must be completed.
• Includes an array of learning opportunities for students: lectures, individual discovery laboratories (in-class and Web-based), team/group discovery laboratories, individual and group review (both live and remote), small-group study sessions, videos, remedial/prerequisite/procedure training modules, contacts for study groups, oral and written presentations, active large-group problem-solving, homework assignments (GTA graded or self-graded), and individual and group projects.
• Uses an initial in-class orientation to provide information about the buffet structure, the course content, the learning contract, the purpose of the learning styles and study skills assessments, and the various ways that students might choose to learn the material.
• Modularizes course content.
• May allow students to earn variable credit based on how many modules they successfully complete by the close of the term, thus reducing the number of course repetitions. Students complete the remaining modules in the next term.
• Eliminates duplication of effort for faculty who divide tasks among themselves and target their efforts to developing and offering particular learning opportunities on the buffet.
• Enables the institution to evaluate the choices students make vis-a-vis the outcomes they achieve (e.g., if students do not attend lectures, the institution can eliminate lectures).


**Resources**

- Defining the buffet model...
  video: (1:27 min)

- NCAT write-up and case studies: [http://www.thencat.org/PlanRes/R2R_Model_Buffet.htm](http://www.thencat.org/PlanRes/R2R_Model_Buffet.htm)
- Case study (2012): Missouri University of Science and Technology, Chemistry Available at: [http://www.thencat.org/States/MO/Abstracts/MUST%20Chemistry_Abstract.html](http://www.thencat.org/States/MO/Abstracts/MUST%20Chemistry_Abstract.html)
- Link to list of case studies: [http://www.thencat.org/PCR/model_buffet_all.htm](http://www.thencat.org/PCR/model_buffet_all.htm)

**HyFlex Model**

HyFlex is a:

course design model that presents the components of hybrid learning in a flexible course structure that gives students the option of attending sessions in the classroom, participating online, or doing both. Students can change their mode of attendance weekly or by topic, according to need or preference. Models like HyFlex, which present multiple paths through
course content, may work well for courses where students arrive with varying levels of expertise or background in the subject matter. Courses built on the HyFlex model help to break down the boundary between the virtual classroom and the physical one. By allowing students access to both platforms, the design encourages discussion threads to move from one platform to the other (“7 Things You Should Know About the HyFlex Course Model,” 2014)

Students frequently take the same final assessment, regardless of the chosen path through the material.

**Resources**

- **Defining the hyflex model...**
  video: (.5 min)

- PowerPoint on the Herkimer version: http://www.slideshare.net/alexandrapickett/bill-pelz-and-jane-verris-the-herkimer-hyflex
- HyFlex World Website: http://www.drbrianbeatty.com/wordpress/

**Flipped Model**

In an effort to unify the definition of Flipped Learning, The Flipped Network states: "Flipped Learning is a pedagogical approach in which direct instruction moves from the group learning space to the individual learning space, and the resulting group space is transformed into a dynamic, interactive learning environment where the educator guides students as they apply concepts and engage creatively in the subject matter." (http://www.flippedlearning.org/definition).

The information presented here has been gleaned from the online reports and personal interviews of instructors who have actually used the flipped model in class. It therefore contains the advice of those who have actually “walked the walk”.

A printable copy of this information is available at

**Is the Flipped Model Appropriate for My Class?**

Hanover Research (2013) gives the following advice:

Before implementing a classroom flip, educators should carefully assess whether the model is appropriate for their curriculum and students. Critical considerations include whether the students will be receptive to a change in instructional ideology, whether the subject material will translate well to the new format, and whether the technology is accessible for all teachers and students.
Dr. Tim Newby (T. Newby, personal communication, November 21, 2013) says that he was motivated to flip by the fact that he was covering similar material every semester, and this material lent itself to being put online. He was using the case study method and students would work on the cases outside of class. When he lectured he was telling the students what they should be doing instead of having them actually do it. He wanted to do it with them in class. So the combination of having repetitive content and a desire for participative learning with his students moved him to adopt the flipped model.

Dr. Regena Scott (R. Scott, personal communication, November 25, 2013), Assistant Professor of Technology Leadership and Innovation at Purdue, says:

[The Flipped Model] is not appropriate for every class. Don’t force it! Evaluate the course outcomes. Can the class be interactive? Is it a team environment? Would [flipping] strengthen learning? Can they learn from each other? Is it project-based, in some way? The course must be fundamentally interactive for a good flip.

Dr. Scott feels that the flipped model is more appropriate for classes where students have to produce a product such as a group project, rather than strictly take exams. Above all, deciding to flip because it is “cool” or “modern” is a poor reason. You should talk to someone who has taught using the flipped model and get their opinion.

**Content considerations**

Hanover Research (2013) notes:

“A common pitfall occurs when teachers assume that all prepared in-class lectures will translate well to digital mediums – reducing a full lecture to a succinct seven-minute video is inherently difficult. Additionally, many teachers fail to incorporate effective scaffolding activities into the lecture to help students absorb, reflect on, and ultimately learn the material.

“Advocates of the flipped classroom model typically recommend that teachers rely primarily on their own digital content, despite the challenge of creating meaningful digital content and increasing availability of third-party online lecture materials.” (see the Resources section below).

Digital content and online and in-class activities should complement each other, and be part of a single design process. One should not be developed as an afterthought to the others.

Caldarera (2013) says:

Don’t Reinvent the Wheel. Although there are many ways to develop your own materials and videos, the collaborative nature of teaching and sharing of educational materials will save you so much time. Find what is out there already and spend more time on the timing, sequencing, and creating clear instructions. Create your own videos or materials as needed, not [for] every lesson.

Vary content to reach students with different learning styles, and don’t use only video. Caldarera (2013) notes:

Lecturing is not bad pedagogy, although it should not be the only method of delivering instruction. It is a consideration to keep in mind for auditory learners. A narrated presentation
or a pre-recorded lecture would supplement other audiovisual media materials nicely in a flipped lesson....Vary your instructional materials as much as possible for all learning types. Include music, music videos, humor, lecture, multiple perspectives, and varied follow up activities as much as you possibly can.

It is important to remember that flipping doesn’t necessarily require the use of video, as Bruff (2012) points out:

In fact, flipping the classroom doesn’t require video at all! There are plenty of us (many inspired by Eric Mazur) who teach in the math and sciences who ask students to come to class prepared to ‘assimilate’ by having read their textbooks. The textbook is not a new technology, but it’s one that college teachers have perhaps not embraced to the extent that they could.

**Student Considerations**

Ullman (2013) notes:

She enjoys flipping, but cautions that it requires students to be independent. ‘It’s an excellent growth opportunity, but the student has to be willing to put in the time and be an active participant in the learning. Some kids listen, do a little homework, and get by. That won’t cut it in the flipped classroom.’

Dr. Tim Newby (T. Newby, personal communication, November 21, 2013) notes that students who are poor planners won’t do well in the flipped model. Since his class contains a lot of freshmen, this was a concern. He compensates for this by giving online quizzes associated with the videos and setting the release criteria so that the quizzes expire before the next class period. Without setting an expiration date, he feels the good students may do the quizzes in a timely fashion but other students may not. With rigid release criteria, 80% - 90% of the students complete the quizzes.

Strayer (2012) notes that the flipped model may not be the preferred design for an introductory course:

Many students in an introductory course do not have a deep interest in the subject and could be frustrated when they encounter learning tasks that aren’t clearly defined. In more advanced classes, students might be more willing to persist in prolonged investigations and make connections with online learning experiences, provided that the structure of the course supports their meaning making in the activity.

**Start with Learning Objectives and Outcomes**

Berrett (2013) notes:

Whatever method a faculty member attempts...he or she should start by defining the underlying concepts to be taught and the learning outcomes that will be demonstrated. And it is not enough...to simply declare that the learning outcome is to cover the first four chapters of a textbook.

...It's a whole different paradigm of teaching...likening the professor's role to that of a cognitive coach. A good coach figures out what makes a great athlete and what practice helps you
achieve that. They motivate the learner to put out intense effort, and they provide expert feedback that’s very timely.”

Dr. Tim Newby (T. Newby, personal communication, November 21, 2013) says that he uses two types of videos in his flip: Content videos which deliver just that, course content, and “Where We Are Going” videos which give students a vision in the form of an “Advance Organizer” of what they will be doing in the upcoming unit. In the Where We Are Going videos, he always includes some sample test questions and tells the students, for example, “You should be able to answer _____”. He states the students love this!

**Select and Master the Instructional Paradigm First**

Miller (2012) says:

We must first focus on creating the engagement and then look at structures, like the flipped classroom, that can support [the engagement]

Just because I record something, or use a recorded material, does not mean that my students will want to watch, nor see the relevance in watching it. I mean, it is still a lecture. Also, this ‘need to know’ is not ‘because it is on the test,’ or ‘because it will help you when you graduate.’ While that may be a reality, these reasons do not engage the students who are already struggling to find meaning and relevance in school. If the flipped classroom is truly to become innovative, then it must be paired with transparent and/or embedded reason to know the content.

One of the best ways to create the ‘need to know’ is to use a pedagogical model that demands this. Whether project-based learning (PBL), game-based learning (GBL), Understanding by Design (UbD), or authentic literacy, find an effective model to institute in your classroom. Become a master of those models first, and then use the flipped classroom to support the learning. Example: Master design, assessment, and management of PBL; and then look at how you can use the flipped classroom to support the process. Perhaps it is a great way to differentiate instruction, or support students who need another lesson in a different mode. Perhaps students present you with a ‘need to know,’ and you answer with a recorded piece to support them. This will help you master your role as ‘guide on the side.’

**Be Willing to Give Up Some Control**

Demski (2013) has the following from Eric Mazur:

If you were to step into one of my classrooms, you'd think I was teaching a kindergarten class, not a physics class,’ laughs Harvard University professor Eric Mazur. ‘Not because the students are children, but because of the chaos and how oblivious the students are to my presence.’ Such pandemonium is a good thing, insists Mazur.... ‘That's how we all learn: by actively engaging in the material rather than sitting in a classroom and writing down the words said by the professor.

Step aside and allow students to learn from each other. ‘Pre-class, my students access digital readings using a web-based, collaborative PDF annotation tool called NB, which was designed by MIT,’ says Mazur. ‘I have been truly impressed by the energy with which my students dive into the readings. I thought I would need to give much more extrinsic motivation [for them] to do
that, but the answer is no, not at all…Within a couple of weeks, my 35 students created 2,000 annotations in their text, discussing the readings asynchronously with each other. Their discussions were incredibly thorough, exciting, and in-depth. Yet, every time I participated in the NB annotations, I killed the discussion among the students, because I was seen as the authority. It stopped them from working it out on their own and finding the solution. [Now] I participate only if there is a situation where they are completely and utterly stuck.’

Running a flipped classroom requires an agility toward what you teach...In a traditional classroom setup, you prepare a lecture, and that lecture does not change between making it and giving it. Whereas, with the flipped classroom, I'm not really sure what my students are going to need to know once I get there. It doesn’t make sense for me to prepare a lecture that covers the entire set of material. They may be really good at all of it and can jump right into the problem solving, or maybe they're stuck on one point that we really need to drill into...In order to be more responsive to students' specific needs, [you can use] clickers to conduct a quick quiz on the pre-class material at the beginning of class time. ‘I'm able to see what I need to do at the line of scrimmage to really target what they need, [one professor] explains. He also monitors students' understanding of course material via the web. ‘My students use [a] discussion board...to post questions and comments as they're reading, and every morning I scan through their discussions to see how they're doing. Oftentimes, misconceptions can get cleared up just through students answering each other's questions...When the software reveals that a lot of students have questions about one particular issue, [you] can then cover the material in class....the flipped model requires more flexibility on the part of the professor. ‘With the flipped classroom, I can't plan; I can only anticipate,' notes Talbert. 'I've taught the class enough in the past to know where the trouble spots are going to be, but really I have no idea what's going to happen from one day to the next. That's what makes it interesting and exciting to teach.’”

Dr. Tim Newby (T. Newby, personal communication, November 21, 2013) says that he likes to lecture, and when he flipped his class he lost control of that. With the lectures online and in-class sessions devoted to group work monitored by TAs, he has a sense that his students don’t need him anymore. This has bothered him somewhat on a visceral level, even though he knows that his students will have a better learning experience. He plans to go on sabbatical and knows that with his TA running the class everything will go on well without him. This can be a bit discomfiting to long-time lecturers. It is not only students that must make adjustments when flipping a class!

**Start Small**

Dems (2013) has the following from Millet:

‘When a professor comes to my office and says he wants to try the flipped classroom model, we'll start by thinking about the pedagogy,’ remarks Millet. ‘We'll look at the class to determine what problems [the professor is] trying to solve. And, maybe, as an introduction to classroom flipping, we won't try to flip the entire class, but identify particular units where students could really benefit from this model. Then we look at what technologies could solve the problems that we've identified.” In a STEM class, for example, the technologies need to support annotation, mathematical equations, and other scientific concepts, whereas a liberal arts class might need more support for capturing audio and video.’

**Plan Accompanying Activities**

Miller (2012) notes:
Every time you have students watch a video, just like you would with any instructional activity, you must build in reflective activities to have students think about what they learned, how it will help them, its relevance, and more. If reflection is not a regular part of your classroom culture, then implementing the flipped classroom will not be as effective. Students need metacognition to connect content to objectives, whether that is progress in a GBL unit, or work towards an authentic product in a PBL project.

Reflection helps the student to connect the new knowledge to their past knowledge and experience, thus reinforcing the learning and helping them to make sense of it.

Concerning non-reflective activities, lower-division or lower-ability students may need activities with more structure. Higher-division or more gifted students can handle more open-ended activities, such as Problem-Based Learning.

Strayer (2012) reinforces the need for reflection:

...students in an inverted [flipped] classroom become more aware of their own learning process than students in more traditional settings. Thus, students in inverted classrooms need to have more space to reflect on their learning activities so that they can make necessary connections to course content. Using appropriate online communication tools to create space for this important reflection to take place can be crucial for the success of an inverted classroom. Further, because this technology provides opportunities to interact with others, this reflection can happen at multiple levels and can be done in community.

Change your notion of class time

Ullman (2013) says:

...flip all the redundant materials that are ‘time suckers’... time is the biggest challenge to delivering a flipped classroom. Flipping your classroom takes a constant level of engagement that can be very tiring because of the research and content that you have to create prior to the lesson itself. However, it is worth it.

When he started flipping, Seigel didn’t realize how much extra time he’d have in class every day. The activities he previously used were not as effective because they were designed around the idea that he would control the pace. Today, every unit contains a guided-inquiry activity, assessments that involve engaging in a conversation with classmates and the teacher, and critical-thinking questions in labs that require an Internet search to produce more complete answers. The biggest challenge I face every year is getting the students accustomed to thinking for themselves. Often I hear, ‘Can’t you just tell me what to do?’ or ‘Can’t you just lecture today? I don’t feel like thinking.’ Because students have been trained to work at the pace the teacher sets, it takes time for them to be comfortable learning in an alternative environment.

In her class, Dr. Regena Scott (R. Scott, personal communication, November 25, 2013) always feels she needs more time, and her students would frequently like more time. Flipping has forced her to come to class ready. She has to be extremely organized. She has found it to be helpful to distribute to her students outlines of how to navigate the processes they will be doing in that class period. She has also found it helpful to place at each table a Plexiglas sign holder that displays a list of what the students will
be doing that day. These two tools – an advance organizer and a task list visible to everyone – help keep her students on track and avoid wasted time. They can come to class and jump right into the activity.

Dr. Scott says that it is not unusual for the pace of the class to control you, and that it is important that instructors not be uncomfortable with this. She stresses that this is not unlike industry, where things move constantly and you have to change. If students finish their work quickly, you have to have some activities planned to take them to another level. Dr. Scott finds that she has to change her activities each semester.

Concerning fears that instructors may not cover enough in a flipped class, McGivney-Burelle, & Xue (2013) say “It is possible to cover the same amount of material in the same amount of time in a flipped unit of study as it through a traditional lecture.”

Enfield (2013) noted various administrative advantages to the flipped approach:

Providing video lessons that students could watch as many times as needed greatly reduced the need for repetitive instruction. Administratively, the videos provided a good resource to direct students to when they were absent from class. The videos also provide the department with the option of providing the same core instruction to all students taking the course, regardless of the instructor.

**Before Introducing Content, Allow Open-Ended Exploration Wherever Possible**

For courses where understanding a physical system is important, research by Schneider, Blikstein & Pea (2013) suggests that allowing open-ended exploration with a 3-d model (physical or virtual) before instruction produces better learning than jumping straight into instruction:

In numerous controlled and rigorous experiments, educational researchers have described how ‘tell-and-practice’ classroom instructions are well-suited for supporting memorization of facts and procedures but prevent students from developing critical thinking and transferring their knowledge to new situations. MOOCs and flipped classrooms are merely recreating the same pedagogical structure without questioning the scientific validity of this model.

The alternative is to put the ‘practice’ in front of the ‘tell’. Learning scientists call this movement ‘Constructivism’ because it emphasizes the fact that students build new knowledge in ways integrated with their existing cognitive structures.

This approach is notoriously difficult to implement. This is not about throwing students in a room and letting them figure things out by themselves. It takes time to carefully engineer good exploratory activities for learners. The pay-off, however, is worth the effort. According to educational researchers, students develop higher critical thinking skills and have a better conceptual understanding of an idea when they can explore a domain first and then follow a more standard kind of instruction (such as attending a lecture, watching a video, or reading a textbook chapter).

The study buttresses what many educational researchers and cognitive scientists have been asserting for many years: the “exploration first” model is a better way to learn. You cannot have the answers before you think of the questions.
Examples of exploratory models might include an automobile engine that students are allowed to take apart and examine before receiving instruction on how it works, or an online animation of a ball rolling down an incline where students can change variables such as the mass of the ball and the degree of the incline to see what differences these make to the speed of the ball down the incline, etc. These activities could be followed by an online discussion of the student’s experiences and observations. Following discussion, formal instruction in the principals involved would be given.

**Consider Having Your Students Construct the Flip!**

Pappas (2011) presents a method flipping that involves student participation in the actual content creation of the class:

“Ultimately, we saw flipping the class as a great opportunity to engage our students in taking more responsibility for their learning. Why not let your students curate the video lessons from existing content on the web? As a follow up to our chat, here’s my seven-step how to:

1. **Start slow!** Pick a single upcoming lesson or unit that you already plan to teach.
2. **Recruit a few of your savviest students** to do the research to find existing online video material to support the lesson. They should include a text overview defining what the students should be looking for in the video.
3. **Also work with the student team** to develop an in-class activity that students will do after viewing the video.
4. **Post the video lesson to your content manager....**
5. **Then run the video as a pilot lesson for the whole class.** Part of their assignment is to decide what they like (and don't like) about the each component of the lesson. In other words, they assist in the design of rubrics for selection of videos and integration of the video lessons into...classroom activities.
6. **Then repeat step 1-3** until you get a good basis for selection of future videos.
7. **Repeat 1-6, as needed,** until your students have curated a collection of online content to support your classroom. They would also be responsible for better defining what constitutes ‘high-quality’ online content and how that can be best used to support a more student-centered classroom.”

In a university course, this technique could probably be used only for upper-level students, and due to the time constraints involved in covering a semester’s worth of material probably only one or a few instructional units could be created. It would be useful in showing the value of flipping, especially if the students themselves then teach the flipped unit. This would also aid learning, because the surest way to learn something is to actually teach it yourself!

**Technology Considerations**

Miller (2012) notes the following considerations:

What technology do you have to support the flipped classroom? What technology gaps exist that might hinder it? Since the flipped classroom is about recorded video, then obviously students would need the technology to [view] this. There are many things to consider here. Will you demand that all students watch the video, or is it a way to differentiate and allow choice? Will you allow or rely on mobile learning for students to watch it? Again, these are just some of the questions to consider in terms of technology. Lack of technology doesn't necessarily close
the door to the flipped classroom model, but it might require some intentional planning and differentiation.

Hanover Research (2013) notes:

“...educators implementing a classroom flip should select simple, accessible, and familiar technology.”

Dr. Tim Newby (T. Newby, personal communication, November 21, 2013) flipped a lower-division learning technology class. Because technology is always changing, he has to regularly update his videos. He redoes about 50% of them per semester and 100% in a year. Instructors who teach in a field where the subject matter is fairly static and won’t change much over time can reuse old videos time after time. Of course, over a period of years students will notice the age difference between the instructor’s appearance in-class vs. online, and this could become an occasion for derision, and instill a sense in the students that the instructor doesn’t care anymore. So be careful about using very old videos featuring your younger self!

Instructors who teach a course with rapidly changing subject matter must build in time to redo videos on a frequent basis. Video editing will be a never-ending chore. Dr. Newby notes, however, that when he lectured he would still have to revise his lectures constantly, so the pressure to revise was still there. He advises instructors to use video editing software that makes it easy to cut and insert changes to existing videos.

Dr. Newby also suggests systematizing the process as much as possible so that the video creation process is as easy and habitual as possible. Always use the same video capturing and editing software, use the same uploading method to the same storage application, etc. The less you have to think about it, the better.

Dr. Newby has other advice:

- Don’t forget that the classroom is part of the technology. Active learning is much easier to conduct in a classroom that is specially designed for it than it is in a large lecture hall. The type of classroom you use is a big deal!
- Use a script and write out every word! Dr. Newby even notates what emotive gestures he plans to use. When he doesn’t use a script he tends to ramble, which ruins the video lecture. This is true even if he uses an outline. A teleprompter is useful when recording live shots, if one can be obtained.
- Don’t make the videos a mini classroom lecture. In the classroom Dr. Newby makes asides and sometimes banteres with the students. When he tried this conversational style on video the students didn’t like it at all. You should get straight to the point, and above all, don’t read the textbook!
- The videos must be short. By following the advice of the previous point, Dr. Newby can condense a fifty minute lecture to about seven or eight minutes.
- Students would much rather watch two ten-minute videos than one twenty-minute video!
- Dr. Newby hired a professional photographer who took about two hundred photos of him making different poses with different expressions. He can insert these as appropriate in his video lessons. He feels that these “personalized emoticons” increase the sense of connection his students feel with him!

McGivney-Burelle & Xue (2013) note:
Creating, editing, and posting videos are time-consuming endeavors as is the development of the in-class quizzes and problem sets. On average, for every class meeting, it took us about 1.5 hours to make one short video and an additional 45 minutes to prepare the quiz and in-class problem set. In contrast, preparing a traditional lecture typically takes us less time. However, once the initial technical and logistical problems were resolved, we were able to spend less time creating a video. Once a polished set of videos and course materials are created the preparation time will be significantly reduced... Those new to flipping should expect many technology glitches especially when creating the first few videos.

Dr. Regena Scott (R. Scott, personal communication, November 25, 2013) notes that students need computers to do their in-class work. When they bring their own, there have been problems getting the required programs to install on their computers. She prefers an arrangement where there is at least one ITaP computer per table. She also likes the capability of sending control of the screen to various tables. She feels that this promotes sharing. Smart Boards can be helpful. She says that in situations where students bring their own devices, power supply is a major issue. It is critical that the room have the electrical infrastructure to allow every student to plug in his/her device!

If possible, use a video system that will supply user analytics. Enfield (2013) points out that this can give valuable information that can suggest to an instructor topics that need reinforcement or additional remediation:

“I intend to explore the use of video analytics to better understand how students use the instructional videos. Video analytics will not only let me see when and how many times a student accesses a video, but will also allow me to see when they are pausing, what parts of the video do they repeat, and how long it takes students to get through the video. The latter is a key piece of information for the videos I create because they were designed so that students will not just watch the videos but work along with them as well.”

Assessments in Flipped Classes

Build assessments that complement the flipped model

Demski (2013) says:

The prevalence of teamwork in a flipped classroom presents an assessment challenge. To tackle the issue, Mazur developed a cloud-based classroom-management system called Learning Catalytics, inspired by a technique developed for team-based learning called IFAT (instant feedback assessment technique). Students log into the system for individual and group-based assessments. ‘Six times a year, my students come into class, they sit around the table, and they each log on to their device,’ explains Mazur. ‘They have anywhere from seven to 10 questions that they need to answer. They work on it individually for about 25 minutes. They’re allowed to Google anything they want, but they’re not allowed to collaborate with others on that part....After 20-30 minutes, I flick a switch on my device and the system switches to team-based mode. Now, if I’m a student sitting at a table with three of my peers, each of our devices displays what the others at our table have answered for each question. Then, as a team, we have to re-answer the questions, but now we can submit only one answer for the table.... As students discuss and agree upon their answers, they learn from each other’, says Mazur.

‘If you were to walk into my classroom during that collaborative part, and I were to tell you that the class is taking an exam, you’d look at me as if I were from Mars,’ he jokes. ‘You’d see
students cheering if they've gotten a right answer, talking to each other, working together, and stepping to the movable whiteboards to demonstrate their points. It's very chaotic, but what happens is that, at the end, the students know their scores instantly. And most importantly, they've learned. The assessment has become a learning opportunity.’

Dr. Tim Newby (T. Newby, personal communication, November 21, 2013) notes that he still offers three exams (two mid-terms and a final) in his class, but the nature of the exams has changed. In his flipped class, the exams are more practically oriented. He asks them to solve case problems similar to the ones they have been working on in class. When he lectured, his exams focused more upon lower-order factual recall. Flipping has allowed him to use cases in his exams. In the review after the exam, he can tell them “This topic was covered in video X. Go back and watch that!”

Dr. Regena Scott (R. Scott, personal communication, November 25, 2013) uses weekly quizzes and in addition has her students write reflection papers, in addition to project-based classroom activities. Rubrics are critical to grading activities in a flipped classroom - otherwise students will take the “shortest line” to completion.

Add Frequent Low Stakes Assessments

Schell (2013) relates the following experience:

In [this faculty member’s] first implementation [of the flipped model], she used the same approach to assessment that she had in her traditional class. Students had three midterm exams and a final exam. In her second implementation, however, she added nine weekly quizzes plus a portfolio project in addition to three midterms. She administered the quizzes with Scantrons.

WHAT? Certainly this would cause a revolt? It seems not. Students have indicated that the quizzes have motivated them to change their approach to learning – i.e. not cram before the midterm. This is also reflected in their viewing patterns…. in the first implementation [without frequent low-stakes testing] there was a huge spike in views in the week before the exam[s], which was not the case for the students in the [second implementation]…they were watching all along.

A striking fact is that this professor noted that the grades for the first two mid-term exams were higher in the second flipped implementation (the one that included frequent low-stakes testing) than in the first implementation with standard testing, even though the exams in the second implementation were more difficult!

Schell (2013) notes a frequent fear of instructors that when the lectures are online they will not attend class, and their grades will suffer. She says:

“In closing, my original question about whether students will attend class if I put all my lectures online seems trivial. Who cares? The real question is will they learn to learn better and will they show greater success in so doing.”

Overcoming Student Resistance to Flipped Instruction

Why Students Resist

Schell (2012) discusses reasons for student resistance:
One reason students resist flipped class methods, including those which use Peer Instruction (PI), is that by the time they arrive in our classrooms, most of them have spent nearly 15 years in a schooling system that trains students in and rewards them for performance on simplistic, mostly low-level learning activities that bulk their procedural muscles through memorization and plug and chug. Students are not used to more difficult, relevant activities that require them to take responsibility for their own learning. Such activities include those that bulk their more heuristic muscles through practice with knowledge transfer, experimentation/creative problem solving and autonomy and persistence.

When I disrupt the expectation of an Easy A among my students (i.e. that they will be able excel without deep conceptual understanding or by making any authentic meaning), it always creates some dissonance for them, and they resist, often vocally, demanding more lecture or rote problem solving at the board. Many want to be told the answer or more accurately, only the answers that are going to be tested. This is not simply a bad student attitude–but a result of an educational system that has not evolved quickly enough to match the needs of a knowledge-based generation.

**Communication and Preparedness**

Dr. Regena Scott (R. Scott, personal communication, November 25, 2013) says that if you are really prepared, students won’t have a chance to resist! She has found from experience that a lot of communication is necessary. She uses announcements in Blackboard, email, verbalized communication in class and the table signs mentioned above. The first time she tried to flip, the students said that they didn’t always know what was going on. Intensive communication has helped reduce confusion in subsequent semesters.

**Set Clear Expectations**

Caldarera (2013) says:

“Convey to your students that in the Flipped Classroom format, they will be expected to complete the lesson as homework. All instructions are to be followed so as to allow more time for engaging enrichment activities in class.”

**Explain to Students How the Flipped Format Will Help Their Learning**

Schell (2012) says:

“Two common recommendations for stemming off student resistance before it starts include 1) explaining new techniques on your syllabus, including a rationale for why you are using them in your class and 2) having conversations with students at the start and throughout the semester about how they are learning.

In our classes, we also often show aggregated data that helps students see the kinds of behaviors that correlate with better performance on their exams.

Another tip is to develop your own understanding of why students resist innovative pedagogies. Check out Brookfield’s [sources of student resistance](#) and Felder’s publications on addressing student [resistance](#) to interactive teaching.”
**Market the Model**

Demski (2013) notes:

"Students come in with a specific mental model of how a classroom ought to work that is quite ingrained... It starts with the professor telling them what to do, and it ends with the professor telling them what to do. When you invert that situation and make them active participants, it really takes a long time, a lot of repetition, and a lot of marketing to get students to buy into this... In order to get students on board, faculty need to be clear and enthusiastic about the flipped model. Prepare to be the marketer for that particular mode of instruction... It takes a great deal of positivity, and every day you need to discuss with your students why we’re doing it this way and not the traditional way, what the benefits are, what they’re getting out of this that they wouldn’t be getting if we did the traditional lecture style, and so forth."

Hanover Research (2013) says:

“Additionally, teachers should clearly communicate the benefits and the reasoning behind such a dramatic classroom shift to students. Teachers who have explained the theory underlying the flipped classroom model often report improved student attitudes.”

**Don’t tell students you are “flipping” or “experimenting”**

Note the experience described by Schell (2013):

“In the first implementation of her flip, Stealth [a pseudonym] used the word ‘flip’ to describe her class to her students. Everything in the literature says to spend time upfront describing exactly what you are doing as a means of meeting the inherent student resistance that will come when you try flipping for the first time.

“I told the students that they were in a ‘flipped’ class and tried to make them partners in creating the learning environment” she says.

“When I heard about what happened next, it caught me like a deer in headlights. I was stunned and had no idea how to help.

“Students in Stealth’s class started a Facebook Page with a thread titled ‘I hate the flipped class.’ This thread was not only active, it had quite a bit of disturbing content. Apparently, students did not complain about the content or the teacher but their dissatisfaction with the ‘flipped class’ was vocal and aggressive. Comments included plans to blast the class in the end of course evaluations and that students were not paying to go to a top university to watch their teacher on a video or to talk to their peers in class.

“Such student resistance can be a huge turn off for instructors who are spending an inordinate amount of care, time, energy, and emotion toward creating a better learning experience for their students. Albeit small, an uprising of vocal, angry, dissenting students can be enough to send some teachers packing their flipped-class suitcases back to the land of lecture for good. I’ve seen it happen myself, at Harvard, and heard about it elsewhere.

“Not so for Stealth... my new hero.
“In several conversations over the past year, Stealth told me that in reading between the lines, she felt students actually had some valid concerns. Instead of chalking it up to the flip class itself and abandoning ship, she sifted through their comments, took them seriously and listened carefully.

“Through this exercise she got an idea that would change the trajectory of her flip and her teaching.

“She discovered that her students seemed to be latching onto the word ‘flip.’ She made several tweaks to her flip approach, but the most interesting to me is that the following semester she did not decide to give up on the flip class. Rather, she decided to give up on using the word flip. ‘I haven’t used the word flipped or flip once in the course or in talking with my students,’ she recently told me—hence the moniker, Stealth Flipper.

“According to Stealth, this tweak has worked brilliantly. ‘Student resistance hasn’t just lessened, it has entirely disappeared,’ she says. Students now come to her office and report how much they enjoy how she teaches, whereas in the fall, they would come in and complain about their ‘flip class.’

“So, she must have just made the class easier, and that’s why they liked better, right? On the contrary, she made it harder and added many more formal assessments.”

Students apparently react viscerally to any indication that they are being experimented upon, and highly resent it. Doesn’t this contradict the advice given above, to set expectations, explain how the flipped format will help their learning, and market the model? Not at all! Just don’t use the words “Flip” or “Flipped”, don’t give any indication that this is a new teaching method either for you or for the course in general, and don’t indicate out loud or in writing that the class is doing anything “cutting edge” or “revolutionary” or “non-traditional”, even though you are. Just keep it low-key and carefully explain to the students what they will be doing and how it will help them and leave it at that.

Vary Your Instruction

Dr. Tim Newby (T. Newby, personal communication, November 21, 2013), as noted above, flipped a lower-division course that has a lot of freshmen in it. He typically uses fourteen case studies per semester. Dr. Newby notes that even with an active learning model, doing the same thing over and over again becomes boring for the students. Typically, by the time of the fourth case study, he hears groans from the class! He has found that varying the instruction helps.

For instance, usually the students work on the cases in groups, but to introduce variety he will have the students complete some of the cases by themselves. He will bring in guest speakers, and even delivers a traditional lecture on occasion. He says that it is important to break up the routine. Remember that in an active learning classroom, an occasional lecture can be a welcome respite! Having variety in the class routine also helps reach students with different learning styles because they are not exposed to the same learning modality all of the time.

Getting Students to Come to Class Prepared

Hanover Research (2013) notes:

“Unsurprisingly, many teachers find that students who are unlikely to complete homework in a traditional classroom are just as unlikely to review lecture materials [in a flipped class] and thereby come to class unprepared. While unprepared students can be difficult in any classroom setting, they are
especially disruptive in a flipped classroom where participation in classroom activities requires a basic understanding of the concepts presented in online lectures.

“Practitioners have developed a number of strategies to motivate such students, including:

- Developing a series of online, post-[video]-lecture quizzes that may or may not be factored into a student’s overall grade,
- Beginning class with a short recap and Socratic discussion of materials presented in the lecture, and
- Beginning each class by reviewing students’ lecture notes or requiring that each student ask at least one relevant question related to the lecture material.
- These rapid assessments can potentially encourage students to actively engage in the video lectures and to increase teachers’ responsiveness to students’ needs.”

Instructors can also institute peer grading, and have the members of each group evaluate the others for the quality and timeliness of their contributions, and other factors.

Restad (2013) remarks that it is important to participate along with the class:

“Be ready to give a five-minute flash lecture to address a confusion you discovered while circulating through the teams. Challenge one team to defend its conclusions against those of another. Build on the class’s insights by making a well-timed observation or summation that furthers the conversation.”

But remember Mazur’s remarks (as quoted by Demski above) – participation by the instructor in certain online collaboration activities can kill discussion. It may be better to restrict active participation to in-class activities.

Schell (2013, June 20) says that properly “chunking” the information into several short videos and having a quiz after each one will encourage learning. The best questions for these quizzes are multiple choice or short answer. She also recommends giving a final quiz at the end of a sequence of several related videos. Quizzes for individual video segments followed by a summative quiz at the end encouraged students to take more notes during the lecture videos.

Brame (n.d.) points out the need for students to complete a task associated with their preparation, and that that task be associated with points. Points for completion may work as well as quizzes in some cases:

“The assignment can vary; the examples above used tasks that ranged from online quizzes to worksheets to short writing assignments, but in each case the task provided an incentive for students to come to class prepared by speaking the common language of undergraduates: points. In many cases, grading for completion rather than effort can be sufficient, particularly if class activities will provide students with the kind of feedback that grading for accuracy usually provides.”

Weinstein and Wu (2009) (as cited in Weimer, 2012) suggest for reading assignments, a more effective strategy for encouraging preparation than quizzing might be the “Readiness Assessment Test”, or “RAT”:

“These tests, done on paper at the beginning of the period or online before class, employ open-ended questions. In this case, students answered two or three of them. The questions were purposefully broad
to prevent students from skimming though the readings in search of answers to detailed questions." Answers to these questions were graded, with each answer earning up to four points.

The following differences between quizzes and RATs were noted:

"...RATs and quizzes were equally effective at encouraging students to read assigned materials thoroughly and helping them prepare for exams. However, with the RAT, the percentage of readings completed was statistically significantly higher. Also, exam scores for those units during which students completed RATs were higher; in the case of the first and second exams, those differences were statistically significant.

Student surveys indicated that 56 percent of the students preferred the RATs, compared with 33 percent who preferred the quizzes. ‘Students who preferred RATs indicated in their open-ended responses that the questions helped them look at the overall meaning of the articles and focus on the main points. In addition, having the RATs due before class helped them prepare to participate in classroom discussions. Students who preferred frequent quizzes reported that their preference was due to quiz questions showing them what to expect from exams and having only one correct answer.’"

It must be noted that this study dealt only with reading material, not with other kinds of multimedia such as videos that might be assigned in a flipped class, although it seems reasonable that it should work with videos as well. Also, due to the time involved in grading open-ended questions, this strategy would best be used in small classes or larger classes with significant TA support.

**Flipped Classrooms and Online Learning**

To many people, the terms “flipped classroom” and “online learning” are synonymous and are often used interchangeably. If you look at the following list, one can make an argument that both flipping and online learning satisfy one or more of these issues:

- Addresses the issues of a student’s diverse styles of learning
- Gives the instructor an effective way to present and manage course content
- Overcomes limitations of time or space in a traditional setting
- Reaches out to homebound or lifelong learners that cannot be on campus

But for the purposes of this article, “flipping” will be considered a component of “online learning” used to deliver content that might otherwise have been presented via a face to face conversation or lecture. With that defined, there are some best practices to keep in mind for online learning in general:

1. **Make it personal** – As opposed to flipped lectures that free up time in the face-to-face classroom, these may be the only opportunities students have to see their instructor and make that personal connection that can make a course more effective. While you certainly do not have to (or want to) make the video 75 minutes of you lecturing to the camera, there is tremendous benefit in either short openings, closings or both that show you speaking to the camera (and in turn, the student). It is a simple but powerful addition to a flipped lesson.

Dr. Tim Newby (2013), in a video response to questions about this topic, spoke of his EDCI 531 course at Purdue (a graduate level course offered online):
“One of the things that happens within online instruction of course is that you aren’t in the same place and I really felt the need for the students to have a feeling of not only me, but of the place of Purdue University. And so I wanted to come up with something so they could get the feel of that. At the same time I am very strong in my feelings towards summarizing and advance organizers that kind of tell you where we are and where we are going and that is really needed, especially in that course. So I thought I could tie all of that together by creating end of the week, or start of the next week videos.

“I sat down and said, ‘Ok, if I were a student, what would I want to know from the professor?’ So I wrote a few notes, then I just walked through them. I would say ‘Hey, what about this, did you get this out of it?’ and ‘did you miss this?’. I was trying to give them hints along the way of where those connections are. I think those are the important parts of learning we sometimes miss. Some of the most watched videos I create are the connection videos that tie everything together. There is something about making that “connection” that is important, and it is magnified for the student who never has that connection. So you can just sit down and talk about it and just be normal. It’s the real Tim Newby. If you were sitting right in front of me, that is how I would be talking to students.”

2. Make it engaging – With online learners, you are always competing for their time and attention. It is too easy to open another browser tab and surf the web if the content of your lesson does not engage them. Use color, sound, voice inflection and humor to keep their interest. Remember, you are competing with people falling off skateboards and cute kittens. As Kevin Makice, Ph. D at Indiana University in Informatics and Computing, says of using online lectures, “Moving a lecture online changes where that information is consumed, not necessarily the degree of student engagement or its effectiveness” (Makice, 2012).

3. Make it short and segmented – Long, full lectures present problems for online learners. Many rely on downloading content to view during commutes or when not on reliable Internet connections, so divide flipped lessons into chunks that they can easily grab and go. It will also be an aid in keeping their attention and make it easier for them to return to the content if they have an issue later. Dr. Newby says that “Timing is important. I think if you go too long, students won’t listen and there needs to be regularity. For me, weekly worked, but if the content is more difficult, then maybe more often that that is needed.” (Newby, 2013).

4. Make it relevant – Good flipped lessons are often presented from a standpoint of being a solution to a real-world problem or situation. It gives context to the viewer that can hold their attention and provides a purpose for your message as well. Use that hook whenever possible. Students are always looking for better feedback, which is relevant to their success. Dr. Newby mentions that “In the past, I have used audio to grade student work. I would put their paper in the background of the video and just walked them through the work and talked to them just like they were in my office, and many students have really liked that approach and it lets me give greater detail than what I would if I was typing feedback.” (Newby, 2013).

5. Make it a two-way street - Flipping the classroom in an online setting can also mean having students create video answers for submission to the instructor. This is a great tool for courses with creativity aspects or where public speaking might be a factor. It engages the students in the creative process, and puts a face to their name for the instructor as well. As Colorado Chemistry teacher John Bergmann, a man often cited as inspiring the term “flipped classroom” said, “I talk to every kid every day.” (Makice, 2012).
6. **Keep it fresh and always evolving** – Dr. Newby is constantly thinking of new videos he can add to make the experience for the online learner more satisfying. “I have actually been thinking of being able to present straight forward content in 5-10 minute videos, where I introduce content, mention things to watch for in the readings, or even saying ‘hey, there is nothing of any value in this section of the readings, so skip over that if I were you’ which students would greatly appreciate knowing. It would help them see the thought process behind how I do things, and they can either agree or disagree with it. That is very important particularly early on in a course.” (Newby, 2013).

**Resources**

**Face-to-Face Help**
A consultant from the Instructional Development Center would be happy to meet with you if you are considering flipping your class. For contact information, see here: https://www.itap.purdue.edu/learning/help.html.

**Web Resources**
- Flipped Classroom Learning Community: [http://flippedclassroom.org/](http://flippedclassroom.org/)

**Reference List**


Enfield, J. (2013). Looking at the Impact of the Flipped Classroom Model of Instruction on Undergraduate Multimedia Students at CSUN. *Techtrends: Linking Research & Practice To Improve Learning, 57*(6), 14-27.


**SCALE-UP Model -**

SCALE-UP spaces are “carefully designed to facilitate interactions between teams of students who work on short, interesting tasks...The basic idea is that you give students something interesting to investigate. While they work in teams, the instructor is free to roam around the classroom--asking questions, sending one team to help another, or asking why someone else got a different answer”. (North Carolina State University, 2011).

**Resources**

*Overview of the SCALE UP method of teaching...*
Watch Old Dominion. (2009). "*Old Dominion: SCALE UP-An Innovative Method for Teaching and Learning*" Old Dominion. Available at: [http://www.youtube.com/watch?v=9ECDGy0wVPA](http://www.youtube.com/watch?v=9ECDGy0wVPA) video: (3:36 mins)

*Student and instructor reactions to SCALE-UP...*

SCALE-UP: About the project - [http://www.ncsu.edu/per/scaleup.html](http://www.ncsu.edu/per/scaleup.html)
6. Develop Instruments to Evaluate Students

(http://dev.itap.purdue.edu/learning/cdm/approach2.html)

Outcomes
In this section we will discuss how to connect your assessments to your learning outcomes and objectives. We can map these connections using the same format we used to tie the outcomes and objectives to the taxonomies.

Overview
“Assessment instruments” specifically refers to instruments for measuring student learning. This includes any tests, activities, group work, projects, essays, assignments, graded and ungraded homework, etc. By developing these now rather than after developing the detailed lessons, you can focus your planning on supporting the student's success. Here you will also develop any rubrics you need to help you evaluate student materials and, if appropriate, to give to your students to let them know what is expected.

The purpose is to identify how you will know if a student has mastered the outcomes at the depth needed (referring back to the taxonomies). One tool for ensuring congruence is to map assessments and assessment items to the course outcomes and objectives.

View these videos for more:

Overview of Assessment
Video: 5:30

Guidelines or Low-Stakes Assessments

Coming soon: High-Stakes & Low-Stakes Assessment. Video: 8:29 (available online at http://www.itap.purdue.edu/learning/cdm/approach2.html)

Examples of Low-Stakes Assessments
**Bloom’s Taxonomy as a Wheel** - Review this version of Bloom’s taxonomy for assessments which match levels.

We also have quite a few articles listed under Resources below that may be of interest in determining the type and effectiveness of assessments.

**Actions**

1. Review your learning outcomes and objectives
2. For each, identify appropriate methods for evaluating student learning
3. Create an overall strategy for measuring success – what types of assessments will you use, approximately when in the semester will you have these, will you have any special or different requirements to use these types of assessments, etc.
4. Check your assessment strategies against the taxonomies to ensure you are measuring within the correct level
5. Map out which learning objectives are covered by each assignment/assessment item and how well they check the objective

Develop rubrics: For each question/item on your assessment/assignment, develop a clear definition of how you will assign grades ([Sample Rubrics](http://www.aacu.org/value/rubrics/index_p.cfm?CFID=2685398&CFTOKEN=41470436))

**Completing the assessment map**

*Sample & blank assessment maps in Word:* [Learning Outcome Maps](http://www.itap.purdue.edu/learning/innovate/assessment.html)

The assessment map is a grid showing down the side the outcomes and matching objectives. Across the top are the levels of Bloom’s Taxonomy (and/or other taxonomies you have identified as appropriate). In the grid, note which assessment will be used to measure that objective. You can create various levels of the map, depending on your needs. For example:

- High-level – outcomes to assessments
- Middle-level – outcomes and objectives to assessments
- Lower-level - outcomes and objectives to a specific assessment
- Even lower-level - outcomes and objectives to a specific assessment questions

**Technologies to support Assessment and Evaluation**


Examples of Purdue Supported Tools
• Formative Assessment:
  • Course Signals,
  • PassNote,
  • Blackboard Rubrics,
  • Adobe Connect,
  • Gradient,
  • iClicker,
  • Blackboard Discussion,
  • Mixable,
  • HotSeat,
  • Confluence

• Summative Assessment
  • Respondus Lockdown Browser,
  • Blackboard Gradebook,
  • Respondus,
  • Study Mate,
  • Camtasia,
  • WordPress,
  • Safe Assign
  • Confluence

Learn More
Examples assessing and evaluating student work -
http://www.itap.purdue.edu/learning/innovate/assessment_examples.html

More about asynchronous and synchronous tools for teaching and learning -
http://www.itap.purdue.edu/learning/innovate/a_synchronous.html

Complete list of Purdue supported tools for teaching and learning -
http://www.itap.purdue.edu/learning/teach/index.html

Complete list of Purdue Supported tools for teaching and learning organized by the Seven Principles for Effective Undergraduate Education - http://www.itap.purdue.edu/learning/innovate/chart01.html

What the 7 Principles of Good Practice in Undergraduate Education Say About Assessment and Technology Use:

Principle 6. Communicate high expectations -
http://www.itap.purdue.edu/learning/innovate/principles/communicate-6.html
Resources


What Methods And Activities Will You Use To Get There?

Outcomes
1. Create course and class session materials and plans
2. Develop class and course activities
3. Teach the class sessions
4. Evaluate the class sessions and determine changes

7. Develop & Teach Course
(http://www.itap.purdue.edu/learning/cdm/methods1.html)

Overview
Now that we have defined what we want to accomplish and how we want to approach it, we can start working on developing the instruction. Developing instruction includes developing the class outlines (for either a single class or group of classes), teaching it, and reflecting on how it went. The following model is a drill-down of the overall steps, focusing specifically on class outline development.

Although you may jump around from area to area, for the most part, the development of instruction starts with EITHER identifying the learning activities OR developing class outlines...

Definitions:
Learning objectives – Within the IMPACT program we use this term to mean the specific goals which make up a learning outcome. So, for each learning outcome, you will have learning objectives. We cover these in the “Develop instruction” step.

Class outline – an overview of what objectives, activities, materials, etc. will be used for a class session or group of class sessions.

Lesson plan – a lesson is a formal, detailed approach to class outlining.

If you have completed the mapping exercises of objectives to assessments and of activities to objectives and levels of taxonomy, sequencing your actual classes may be easier (refer to Approach for more on mapping).

Identify Activities
(http://www.itap.purdue.edu/learning/cdm/activities.html)

Overview:
Some student activities will be significant enough to be the main focus of your class outlines. Others may fit within your lesson plans. Identifying them
before you start planning your lesson can help you identify a direct tie to the lessons as well as to the objectives for the lessons.

Student-centered learning and active-learning can significantly support student learning. Read What is being said about student-centered learning? for some quotes on this.

Watch this video of Dr. Felder discussing active learning - 11:43

Some Concepts for You to Consider...
- Practice for proficiency
- Active learning techniques ranging from simple to complex
- Memorize or find?

Practice for proficiency
When students learn something new, they go through a process of not knowing what they don’t know to unconsciously knowing something. Here’s a diagram of the process...

(Developed at the Gordon Training International by Noel Burch in the 1970s)

And here is an example:
This theory may not apply to your course as it is most applicable to skills that students must be able to do by rote such as measuring drugs or using basic word processing skills.

When you are working with your students, think about which step in this process they need to achieve and design your lesson plans accordingly. It is NOT always necessary to give them enough practice for them to achieve unconscious competence, but a purposeful decision on your part will help ensure that you get them to the step you want by adding the appropriate activities, including homework.

**Active learning techniques ranging from simple to complex**

According to Bonwell & Sutherland, it is helpful to "have a framework that would allow faculty to consider their course objectives and teaching style and to determine through self-reflection what active learning strategies best meet their individual needs. For while developing teaching strategies that are less heavily based on the lecture method is certainly important, it is not the case that the lecture must be abandoned or that all faculty must begin using groupwork in their classes. What is important is for instructors to find approaches that fit their personal style of teaching and meet their educational objectives, while at the same time actively engaging students as they learn in the college classroom."

Based on Bonwell & Sutherland's continuum of simple to complex active learning strategies, O’Neal & Pinder-Grover provided some examples of strategies on the continuum:
Here is the reference for the Bonwell & Sutherland article:


**Memorize or find?**

Another perspective is that you might expect that your students will be able to recall certain aspects of their learning from memory, while in other cases you will want them to know how to find information. E.g., Frank Dooley expects that his students in AGEC 20300 will use their book, notes, or Google to find the formula to calculate a cross-price elasticity of demand. But he expects that they will know from memory that a negative sign for a cross-price elasticity means the two products are compliments.

**Lists of some active learning strategies**

Actually finding activities may be tricky, but here are some tools that may help:

1. Reece & Walker's [Chart of Common Teaching Techniques](http://chartofcommon.com/) which maps common activities to Bloom's Taxonomy

2. [Active Learning Strategies in the Large Class](http://activelearningstrategies.org/) - many can be used in smaller classes, too.

**Actions:**

1. Considering the demographics and nature of your students, identify learning activities that will be appropriate for these learners
2. Identify learning activities that will help these learners grow
3. Identify activities which fit within your transformation model
4. Identify activities which will involve students at the appropriate dimension of the taxonomies - this may help: Reece & Walker's Chart of Common Teaching Techniques which maps common activities to Bloom's Taxonomy.

5. Consider what level of competence students should achieve and the amount of activities/practice this will involve.

6. Identify what materials, information, and support students will need to complete the activities:
   - Are the students comfortable working in teams?
   - Are the students comfortable with active learning strategies/purposes?

Resources:
General strategies for active learning:

- Purdue Technology Tools that Support the 7 Principles of Effective Instruction - [http://www.itap.purdue.edu/learning/innovate/chart01.html](http://www.itap.purdue.edu/learning/innovate/chart01.html)
- Chart of common teaching techniques - [Chart of common teaching techniques](http://www.itap.purdue.edu/learning/innovate/chart01.html)
- [Active Learning Strategies in the Large Class](http://www.itap.purdue.edu/learning/innovate/chart01.html)
- [Digital Storytelling](http://www.itap.purdue.edu/learning/innovate/chart01.html)

Course or Module-based Learning Strategies:


Problem-based (PBL):


Inquiry-guided (IGL):

Develop Class Outlines or Lesson Plans
(http://www.itap.purdue.edu/learning/cdm/lessons.html)

Overview
Developing some prototypes of class sessions can help you finalize your thoughts about the overall approach to the course and additional adjustments you might want to make. Some people develop a class outline for each unit (or group of sessions). The class outline can lay out what you want to cover and how you will cover it. You may also want to include who will be involved, equipment and material needed, etc.

A formally structured class outline is frequently referred to as a lesson plan. Some format and samples are available here for your reference.

Remember that a single class outline does not necessarily equate to a single course session.

Purpose for Class Outlines

- LPs (Lesson plans) stimulate instructors to consider more deeply what can and should be accomplished in a class. All the elements of a great class--modeling, sequencing, reviewing, and checking--are more effective if planned for [rather] than left to chance.
- LPs encourage the instructor to think more deeply on the specific needs of each student in the class. Thus, the specific needs and learning styles of students can be considered in planning, as well as the learning and teaching styles of the instructor. In large classes, while the individual students may not be specifically accommodated, the instructor can identify strategies which are more likely to support learning for students with various learning styles.
- LPs provide an excellent basis for discussion between peers, committee members, and instructors and students. For new instructors and veteran instructors alike, lesson plans provide good bases for improving program design, planning professional development, and sharing lesson goals with students and even involving them in planning classes.
- LPs invite instructors to be innovative, to consider a variety of approaches, or try new things that might get better results. Human beings, teachers included, get stuck in comfortable habits (i.e.,
“ruts”), and busy schedules tempt teachers to “wing it” rather than plan out a class. Time spent on lesson planning often leads instructors out of their ruts.

- LPs help instructors be prepared, feel more confident, and deal better with surprises. A good lesson plan can help an instructor feel grounded, more confident, and able to foresee challenges and students’ questions. By the same token, with this grounding the instructor is better able to handle digressions and unforeseen challenges and, ironically, be more flexible.

- LPs deepen the instructor’s own knowledge and skills. Thorough lesson planning can push an instructor to make certain she knows the content, understands how to apply the skills to be covered in the planned class or classes, and, after the class(es) assesses how things actually went.

- LPs can be shared. Written curriculum and lesson plans are forms of “captured wisdom” that can be shared with other instructors or adapted to fit another class level, so they don’t have to start from scratch every class. They can also be given to help instructors new to the program (or new to teaching) get a sense of what instruction is like in a specific program.

- LPs provide a good record of what actually occurs in the classroom. Such records can be kept on file to form the bases for future classes, or to help substitute instructors cover classes effectively.

**Sequencing - a bit of theory**

The flow of topics will be based on your learning objectives. Within the class outline, however, you will need to identify how to approach actually teaching an objective. One sequencing technique is McCarthy’s 4MAT system. Based on significant research in learning styles and brain hemisphericity, the 4MAT system has been applied in a wide range of instructional situations.

![4MAT System Diagram](image)

Basically, McCarthy recommends that instruction follows a sequence of:
1. Why should I know this?
2. What is this?
3. How do I do it?
4. What if something happens?

For more on 4MAT, please see AboutLearning: [http://www.aboutlearning.com/what-is-4mat](http://www.aboutlearning.com/what-is-4mat)

**Actions:**

1. Review various lesson plan formats (some samples are below) to identify or create a format you will use for class outlining
2. Reflect on previous classes to identify things that went well, areas you might want to improve, etc.
3. Refer to your map of outcomes and objectives - does this suggest any groupings of topics/activities?
4. Develop class outlines including specific activities and modes of learning
5. Map your class events (activities, lectures, etc.) on top of your assessment map to ensure you are teaching at the level you will be assessing.
6. Think about including details such as:
   a) approximate length of time for each item
   b) list of equipment and amount of each item (example: computer for each student group, flipcharts, safety glasses per student...)
   c) any special notes or materials you want to remember
7. Decide if you want to include a student mini-evaluation or feedback ([Quickly Gathering Student Feedback Techniques](http://www.baltisearch.com/education/school/madelinehunter.html))
8. Plan for leaving ten minutes at the end of class for questions, problems, review, etc.
9. Consider including ten minutes of optional activities or material for flexibility in your instruction.

**Resources:**

Sample lesson plan formats
- For more examples:
  - [http://wvde.state.wv.us/teach21/quality-lesson-design.html](http://wvde.state.wv.us/teach21/quality-lesson-design.html) - includes Inquiry-based lessons and Project Based Learning
  - [http://www.squidoo.com/lesson-plan-template#module159903914](http://www.squidoo.com/lesson-plan-template#module159903914) - 10 sample formats for lesson plans

If you would like to incorporate a new learning technology, please contact the IDC in ITaP - individual consultations can be [requested here](#) (or IT academic technologies in your own college or university).
If you would like to work with a librarian about incorporating new materials or information literacy, please contact your library.

**Teach**  
([http://www.itap.purdue.edu/learning/cdm/teach.html](http://www.itap.purdue.edu/learning/cdm/teach.html))

Using your class outline as a guide, lead your students through the learning activities.

Although this section is short, please note that you can find many resources on the actual teaching of your course. For example, the Purdue Center for Instructional Excellence has many resources for teaching. The Purdue Instructional Design Center provides help on effectively using instructional technologies. And the Purdue Libraries not only have librarians for each discipline, but also provide support on information literacy, copyright, writing guides, and much more.

**A few of the skills commonly needed in teaching include:**
- opening a session (see Chickering and Gamson's Principle 1 – Encourages Contact Between Faculty and Students)
- developing effective presentations
- using visual aids (PowerPoint, materials, books, etc.) effectively (see Presenting with digital tools)
- leading discussions
- managing students (see Organizing with digital tools)
- using leading questions
- giving feedback (see Chickering and Gamson's Principle 4 – Gives Prompt Feedback)
- managing student activities (see Organizing with digital tools)
- encouraging homework completion (see Chickering and Gamson's Principle 6 – Ideas for using Technology to Communicate High Expectations)
- answering questions (see Communicating with Digital Tools and Chickering and Gamson's Principle 4 – Gives Prompt Feedback)
- setting goals and expectations (see Chickering and Gamson's Principle 6 – Ideas for using Technology to Communicate High Expectations)
- creating a comfortable learning environment (see Chickering and Gamson's Principle 1 – Encourages Contact Between Faculty and Students and Chickering and Gamson's Principle 7 - Respects Diverse Talents and Ways of Learning)
- assessing prior knowledge
- encouraging student participation (see Collaborating with Digital Tools)
- summarizing and closing a session (see Communicating with Digital Tools)

Each of these could be a workshop in itself. If you are a new instructor, you may want to contact the Center for Instructional Excellence to develop a plan for identifying needs and plans for improvement.

**Actions**

1. Before you step into the classroom
   - Review any reflections from previous lessons/courses to prepare yourself for this one
   - Review your class outline to refresh your mind
• Review your class outline to make sure you have all the materials and equipment needed
2. Teach!
  • Adjust your plan on the fly as needed

Resources
If you would like support in leading engaging discussion, managing a classroom, etc., please contact the Center for Instructional Excellence, ITaP, and/or the Libraries.

Evaluate and Reflect
(http://www.itap.purdue.edu/learning/cdm/reflect.html)

Overview
At the end of each session, many find it helpful to reflect on how the session went compared with the class outline. This reflection does not need to be a deep, soul-searching process. It could take just a few minutes at the end of each class. Frank Dooley, for example, spends a few minutes in the classroom jotting notes on his lesson plan.

Likewise, after reviewing student work, you may want to reflect on the assignment expectations compared with the student work. You can jot down some notes on your class outline, assignment description, assessment or course map.

Don’t worry about the quality of writing; you are the only intended audience.

Benefits of immediate evaluation:
• next class session: you may identify changes to your next class session based on something that went particularly well or not so well
• next time you teach the course: Rather than racking your brain to recall how a class went, you can check your class outline
• next assessment: you may identify changes need for the assessment such as a need to clarify your expectations or to adjust the topic.

Many faculty also find it helpful to discuss with other faculty the activities they have tried, how they went, and how they could be done differently next time. If you are interested in this, consider some of the possible methods. These could be discussions with IMPACT Fellows, others in your department, your support team.

Actions - After each class session:
1. As soon as possible after class, spend five to ten minutes reflecting on the class. Note your reaction to the lesson
  • What do you think went particularly well?
  • What could have gone better or smoother?
  • What would you do differently next time?
  • What should you discuss in the next class?
  • What questions did the students ask?
  • Should you change the order or presentation?
2. If you included a student mini-evaluation or feedback, review and reflect upon student responses
   • For evaluations, what do you need to cover in more depth (or in less?)
   • For feedback, what can you do in future classes to support earning more?
   • What will you share with the students based on their input?
3. Determine changes to next class session
   • Do you need to cover some material again?
   • Do you need to clarify any material?
   • Do you need to change your next class outline?

**Actions - After each assignment/assessment:**
1. Spend five to ten minutes reflecting on the assignment and how student did. Note your reaction to their work
   • What do you think went particularly well?
   • What could have gone better or smoother?
   • What would you do differently next time?
   • What should you discuss in the next class?
   • Should you change the assignment or directions?
2. Determine changes to next class session
   • Do you need to cover some material again?
   • Do you need to clarify any material?
   • Do you need to change your next class outline?

**Resources**
- Center for Instructional Excellence
- ITaP Teaching and Learning Initiatives
- Library
8. Evaluate Course
(http://www.itap.purdue.edu/learning/cdm/methods2.html)

Outcomes
1. Complete notes on changes for next offering
2. Notes on changes for other courses
3. Ideas for changing your teaching style, approach, materials

Overview
At the end of the semester/term, you have a great opportunity to evaluate how everything went. This is helpful for improving this course and any others you teach. It can also provide information that can inform changes to the curriculum/program.

Actions
1. Reflect on the student experience
   a. Review student course evaluations
   b. Review results from any student mini-evals you used (see Quickly Gathering Student Feedback Techniques)
   c. If you used any other student feedback methods (SGIDs, confidence, or other surveys), review these again.
   d. Based on your reflections of the student experience, write up 2 or 3 new approaches or changes you might try next time.
2. Reflect on your assessment strategy
   a. Read your course learning outcomes and objectives and review your maps of assessments
   b. Check student grades on each of the assessments
   c. Evaluate examinations, projects, and assignments – did these match the learning outcomes and objectives?
   d. Review your rubrics for effectiveness and appropriateness
   e. Compare student grades from this course to previous years, or, if you ran a control class, to that course
   f. Based on your reflections of the lessons, write up 2 or 3 new approaches or changes you might try next time.
3. Reflect on your class sessions
   a. Read your course learning outcomes and objectives and review your maps of assessments and class outlines
   b. Review your session reflections
   c. Review active learning techniques you used
   d. Review the instructional technologies you used
   e. Write up 2-3 changes or enhancements for next time
4. Reflect on the learner characteristics you identified earlier. How accurate were these? Can you expect students to have the same characteristics next offering or will this change? Write up changes you should consider or check out for the next course
5. Based upon your reflections, write up changes to your course at each stage in the process
6. Identify new resources to support improvement in developing and delivering your course
7. Identify any opportunities for professional development for yourself – for example, Center of Instructional Excellence workshops, Library discussions, and ITaP workshops.

8. Consider implications of your reflections on other courses you teach - How can this experience support continued personal growth in this and other courses?

9. Consider implications for the overall program/curriculum. Would the overall program benefit from changes? If yes, what actions can you take you provide this feedback?

10. Go back to the beginning! This is an iterative process, or a process of continuous improvement, if you want it to be!

Resources

- Center for Instructional Excellence
- ITaP Teaching and Learning Initiatives
- Library
Appendices
IMPACT assessment techniques
Excerpts from: IMPACT Annual Report – November 2012

Program Assessment Dimensions
The effectiveness of the IMPACT program is evaluated through a comprehensive assessment plan led by the DLRC. The IMPACT Assessment Committee is composed of faculty and staff from the DLRC, CIE, ITaP, and the Office of the Provost.

The evaluation plan has been designed to answer research questions regarding the efficacy of the IMPACT program at meeting its stated objectives and the effectiveness of the program at achieving its intended outcomes. These research questions are presented below and fall into three primary groups: questions related to the success of the FLC at catalyzing change action in faculty, questions related to student perception of the course reforms, and questions related to the efficacy of IMPACT at improving student learning and retention. The progress to date of the assessment subcommittee at addressing each question is summarized in the sections that follow.

Catalyzing Change in Faculty
1. What are faculty expectations for IMPACT as a professional development program? What did faculty get out of their participation in IMPACT FLC?

2. What are faculty goals for course redesigns? What redesigns did faculty implement? What were the barriers and supports during their redesign and implementation?

3. Is the transformation achieved in IMPACT transferred to other courses taught by IMPACT faculty fellows?

4. What percentage of the courses leave IMPACT with five clearly defined learning objectives and associated assessments?

5. What is the distribution of learning objectives related to each level of Bloom’s taxonomy?
6. What is the effect of IMPACT on the attitudes of administration and non-IMPACT faculty with respect to teaching and learning?

**Faculty Change**

1) What are faculty expectations for IMPACT as a professional development program? And what are the perceived impacts of the professional development series on participants’ teaching practices?

*Data collection:*
- Individual Interviews
- Surveys

2) What are faculty goals for course redesigns? What redesigns did faculty implement? What were the benefits and challenges encountered during their redesign and implementation?

*Data collection:*
- Open-ended survey (course-level, student-level, and personal goals for participation in IMPACT)
- Individual interviewed after redesign implementation
  - Changes made
  - Barriers encountered during their participation
  - Support received during participation
- Survey with supplemental focus groups for future cohorts

3) What percentage of the courses leave IMPACT with five clearly defined learning outcomes and associated assessments?

*Data collection:*
- Faculty identified course learning outcomes are being collected and archived.

4) What is the distribution of learning outcomes related to each level of Bloom’s taxonomy?

*Data collection:*
- Faculty course learning outcomes are being collected and archived.

5) What is the effect of IMPACT on the attitudes of administration and non-IMPACT faculty with respect to teaching and learning?

*Data collection:*
- Colleagues of faculty fellows who implemented their redesigns in fall 2011 were surveyed to determine their awareness and understanding of IMPACT and their attitudes toward its goals.

**Student Perceptions**

1. Do students participating in IMPACT courses perceive these courses as engaging them in active learning?

2. Do students participating in IMPACT courses feel an enhanced sense of confidence and competence?

3. What is the influence of the IMPACT courses on student course evaluations?

4. What is the influence of the IMPACT courses on Student Perceptions of Learning Gains (SALG)
Student Perceptions
1) Do students participating in IMPACT courses perceive these courses more engaging than the traditional version of the courses?

Data collection:
- A survey was constructed and administered to students enrolled in courses redesigned by faculty fellows in cohort 1.
- Where appropriate, comparison data were also collected using the same survey from students enrolled in traditional versions of the redesigned courses.
- The survey has been recently redesigned to incorporate levels of student motivation, as well as, the activity/engagement of the learning environment. This survey will be completed by students starting in Fall 2012.

2) Do students participating in IMPACT courses feel an enhanced sense of confidence and competence?

Data collection:
- Items related to confidence and competence were incorporated into the modified learning environment survey (discussed in question 1 above).
- Starting in Fall 2012 (cohort 2), students enrolled in courses redesigned by faculty fellows are being surveyed with the modified learning environment survey.

3. What is the influence of the IMPACT courses on student course evaluations?

Data collection:
- End of the semester course evaluations data is collected every semester and reported.
- Data for the two standard approved questions at Purdue University is collected and reported.

4. What is the influence of the IMPACT courses on Student Perceptions of Learning Gains (SALG)

Data collection:
- Faculty identified Learning Outcomes are included in the form of SALG on the end of the semester course evaluations data. This data is collected every semester and reported.
- The extent to which students perceive the faculty identified learning outcomes to have been attained comprises the results of this analysis.

Student Learning and Retention
1. Does the implementation of IMPACT courses improve course grades compared to non-IMPACT versions of the same class?
2. Does student participation in IMPACT courses improve student performance in selected future courses?
3. Does participation in IMPACT courses improve student critical thinking skills?
4. Does participation in IMPACT courses improve retention to the institution after one year?
5. Does participation in IMPACT courses improve retention to the major after one year?
6. Do students involved in IMPACT have better four and six year graduation rates?
7. Do students involved in IMPACT courses perform better on faculty identified measures of learning?
Student Learning and Retention

1) Does the implementation of IMPACT courses improve course grades compared to non-IMPACT versions of the same class?
   
   **Data collection:**
   - Examine historical grade trends
   - Comparison of concurrent IMPACT and traditional sections

2) Does student participation in IMPACT courses improve student performance in selected future courses?

   **Data collection:**
   - The spring 2012 grades of students who experienced one of the redesigned courses taught by cohort 1 in fall 2011 were compared with those of their peers who had not experienced an IMPACT course.

3) Does participation in IMPACT courses improve student critical thinking skills?

   **Data collection:**
   - The assessment committee is currently exploring options for appropriately, effectively, and efficiently measuring critical thinking skills.

4) Does participation in IMPACT courses improve retention to the institution after one year?

   **Data collection:**
   - The assessment committee has not yet examined one year retention rates.
   - However, within year retention rates (fall to spring retention rate) was examined for cohort 1 courses taught in fall 2011.

5) Does participation in IMPACT courses improve retention to the major after one year?

   **Data collection:**
   - This goal is very difficult to assess and the Assessment Committee is currently working on a strategy to achieve this outcome.

6) Do students involved in IMPACT courses have better four and six year graduation rates?

   **Data collection:**
   - This goal is very difficult to assess and the Assessment Committee is currently working on a strategy to achieve this outcome.

7) Do students involved in IMPACT courses perform better on faculty identified measures of learning?

   **Data collection:**
   - Working with a subset of cohort 2 faculty fellows to align well defined course learning outcomes to faculty created assessment measures (see Appendix A for an example of a Learning Outcome Map).
   - Working with all of cohort 3 faculty fellows (starting in the Summer 2012) to align well defined course learning outcomes to faculty-created assessment measures (see Appendix A for an example of a Learning Outcome Map).
   - Completing research protocols in order to link student perceptions of the learning environment, perceptions of competence and confidence in the material learned to actual performance on identified learning outcomes.
   - Completing research protocols in order to compare actual performance on identified course learning outcomes before and after the redesign or with traditional courses.
SoTL – Is it working?

Is it working?

To determine if the IMPACT redesign is working we measure student self-reports and mapped learning outcome data across various time points in your course. Ideally IMPACT begins this assessment BEFORE you have made any changes to your course (during the semester when you are working on Stage 1 items for the first time).

Stage 1 – During the redesign phase
  • Creation of baseline

Stage 2 – During the implementation phase
  • Assessment when the redesigned class begins

Stage 3 – During the implementation phase
  • Assessment when the redesigned class ends
SoTL – What does “mapped learning data mean”?

Is the redesign working?

The IMPACT program uses course learning outcomes (LOs) linked to course assessments as an important part of determining redesign success:

- Learning Outcomes (LOs)
- Transformation
- Assessment

- I am revising or writing new Learning Outcomes (LOs).
- My course assessment procedures can be mapped to my LOs.

- If you have revised or written new LOs, it is essential that they map to your assessments.

- I am revising my assessment practices to align them to my new or revised LOs.
- IMPACT needs you to map your LOs to your course data as far back as you have used these LOs and to continue mapping moving forward. IMPACT will use this historical data to track changes over time.

- Yes
- No

- I have NEW LOs.
- My redesign uses previously established LOs

Based on your answers your redesign will fall into one of three possible scenarios.*

**Scenario A**

The redesign process results in new LOs and possibly (but not necessarily) new assessments. As part of IMPACT, we will help you conduct a within-course analysis, tracking your NEW LOs and assessments moving forward.

To accomplish this goal, mapped data for your redesigned course will be necessary moving forward.

**Scenario B**

We will help you conduct a historical comparison of your modified LOs and/or assessments. Scenario B is a mixed design, and the changes are mapped to previous, current, and redesigned courses.

To accomplish this goal, we will map data for previous, current, and redesigned courses. If mapping is not possible, move to Scenario A.

**Scenario C**

We will help you conduct a historical comparison of your course assessments and LOs using your course data mapped to your LOs.

To accomplish this goal, mapped data for previous, current, and redesigned courses will be necessary.

*note. If you are teaching multiple sections or another instructor is teaching the same course it is important to let your IMPACT support team know. This mirror course could serve as a control class to answer the question: Is the redesign working?
Student motivation: Keller’s ARCS Model

In their ARCS model, Keller and Ryan identified four features in student motivation.

Attention:
- Inquiry
- Humor
- Variability
- Participation
- Concreteness
- Incongruity & Conflict

Relevance:
- Immediate applicability
- Future Usefulness
- Need Matching
- Experience
- Modeling
- Choice

Confidence:
- Learning Requirements
- Self-Confidence
- Expectations
- Attributions
- Difficulty

Satisfaction:
- Scheduling
- Positive Outcomes
- Unexpected Rewards
- Natural Consequences
- Avoid Negative Influences
Taxonomies/Domains of Learning

The domains with examples and verbs for each level.

Cognitive, Psychomotor and Affective Domains used with permission from:

Interpersonal Domain from:
Cognitive Domain

Remembering

Examples: Recite a policy. Quote prices from memory to a customer. Know the safety rules.

Key Words: defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.

Understanding

Examples: Rewrites the principles of test writing. Explain in one’s own words the steps for performing a complex task. Translate an equation into a computer spreadsheet.

Key Words: comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.

Applying

Examples: Use a manual to calculate an employee’s vacation time. Apply laws of statistics to evaluate the reliability of a written test.

Key Words: applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.

Analyzing

Examples: Troubleshoot a piece of equipment by using logical deduction. Recognize logical fallacies in reasoning. Gather information from a department and select the required tasks for training.

Key Words: analyzes, breaks down, compares, contrasts, diagram, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.

Evaluating

Examples: Select the most effective solution. Hire the most qualified candidate. Explain and justify a new budget.

Key Words: appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports.

Creating

Examples: Write a company operations or process manual. Design a machine to perform a specific task. Integrate training from several sources to solve a problem. Revise and process to improve the outcome.

Key Words: categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, writes.
Receiving Phenomena

Examples: Listens to others with respect. Listens for and remembers the names of newly introduced people.

Key Words: asks, chooses, describes, follows, gives, holds, identifies, locates, names, points to, selects, sits, erects, replies, uses.

Responding to Phenomena

Examples: Participates in class discussions. Gives a presentation. Questions new ideas, concepts, models, etc. in order to fully understand them. Knows the safety rules and practices them.

Key Words: answers, assists, aids, complies, conforms, discusses, greets, helps, labels, performs, practices, presents, reads, recites, reports, selects, tells, writes.

Valuing

Examples: Demonstrates belief in the democratic process. Is sensitive towards individual and cultural differences (value diversity). Shows the ability to solve problems. Proposes a plan to social improvement and follows through with commitment. Informs management on matters that one feels strongly about.

Key Words: completes, demonstrates, differentiates, explains, follows, forms, initiates, invites, joins, justifies, proposes, reads, reports, selects, shares, studies, works.

Organization

Examples: Recognizes the need for balance between freedom and responsible behavior. Accepts responsibility for one's behavior. Explains the role of systematic planning in solving problems. Accepts professional ethical standards. Creates a life plan in harmony with abilities, interests, and beliefs. Prioritizes time effectively to meet the needs of the organization, family, and self.

Key Words: adheres, alters, arranges, combines, compares, completes, defends, explains, formulates, generalizes, identifies, integrates, modifies, orders, organizes, prepares, relates, synthesizes.

Characterization


Key Words: acts, discriminates, displays, influences, listens, modifies, performs, practices, proposes, qualifies, questions, revises, serves, solves, verifies.
Interpersonal Domain

Summarizing

Disagreeing

Shutting out or Bringing in

Building and Supporting

Proposing

Seeking or giving information
Bloom’s Taxonomy as a Wheel

Samples of Learning Outcomes
[http://dev.itap.purdue.edu/learning/cdm/accomplish1a.html]

ECON 210 Principles of Economics
Core Learning Objectives

Course-wide learning outcomes:
1. Identify economic costs and benefits of making individual and economy-wide decisions.
2. Predict market equilibrium prices and output levels resulting from changes in economic costs and benefits.
3. Create and interpret graphical representations of cost/benefit analysis as reflected in market demand and supply curves.
4. Calculate basic measures of macroeconomic performance in output, labor, financial, and foreign exchange markets.
5. Analyze changes in macroeconomic performance in response to changes in fiscal and/or monetary policy.

Textbook: *Economics: A Survey* by Barron, Lynch, and Blanchard
Chapters 1-7, 13-18, 20

<table>
<thead>
<tr>
<th>Chapter 1: Scarcity and Opportunity Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Explain the economic concept of scarcity and recognize how various economic systems deal with scarcity</td>
</tr>
<tr>
<td>2. Differentiate economic cost from standard measures of cost</td>
</tr>
<tr>
<td>3. Distinguish between positive and normative analysis</td>
</tr>
<tr>
<td>4. Describe the use of economic models in economics</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter 2: Gains to Specialization and Exchange</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Explain the nature of production efficiency based on comparative advantage</td>
</tr>
<tr>
<td>2. Use individual production possibility frontiers to illustrate the concept of comparative advantage and resulting gains to specialization in production and exchange</td>
</tr>
<tr>
<td>3. Demonstrate how the resulting shape of the economy-wide production possibility curve</td>
</tr>
</tbody>
</table>
1. **Describe** the condition of the economy (and sometimes the condition of your personal finances) using the main economic measurements: gross domestic product, inflation, unemployment, exchange rates, and interest rates.

2. **Predict** changes in prices and quantities in a market using demand and supply analysis.

3. **Predict** the results of economic events or policy changes on the outlook for the economy, using a macroeconomic model.

4. **Analyze** the important events in U.S. economic policy history using the macroeconomic model and the main economic measurements, e.g. bimetallism, founding of the Fed, Great Depression, New Deal, WWII, Great Inflation, Great Recession.

5. **Analyze** the important economic policy issues facing the U.S. using the macroeconomic model and the main economic measurements, such as budget deficits, monetary expansion, health care costs, Social Security finance, recovery from Great Recession, relations with Europe, relations with China.

1. **Analyze** the important economic policy issues facing the U.S. using the macroeconomic model and the main economic measurements, such as budget deficits, monetary expansion, health care costs, Social Security finance, recovery from Great Recession, or relations with Europe and China.

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4. **Analyze** the important events in U.S. economic policy history using the macroeconomic model and the main economic measurements, such as bimetallism, the founding of the Fed, the Great Depression, the New Deal, World War II, the Great Inflation, or the Great Recession.

5. **Predict** changes in prices and quantities in a market using demand and supply analysis.
Module 3 – Organic Modeling
Video Lectures:
1. Setting Up the Scene
2. Creating the Shape of the Toast
3. Extruding the Leg
4. Extruding the Arm
5. Modeling the Hand
6. Modeling the Head
Assignment 3: Modeling C-Man
- Black background (-80 NA)
- Poorly framed movie (-1i0 NA)
- Poorly Composed Cameras (-1i0 NA)
- No audio (-1i0 NA)
- No shadow (-1i0 NA)
- No Go-Back (-1i0 NA)
- No Go-Through (-1i0 NA)

Module 6 – Rigging
Video Lectures:
1. Flying Jesus
2. The Spider in the Chair
3. The Left Leg
4. The Right Leg
5. Swinging the Man
Assignment 6 – Rigging C-Man
- Poorly framed movie (-1i0 NA)
- Poorly Composed Camera (-1i0 NA)
- No audio (-1i0 NA)
- No shadow (-1i0 NA)
- No Go-Back (-1i0 NA)
- No Go-Through (-1i0 NA)

Module 4 – Unwrapping and Texturing
Video Lectures:
1. UV Mapping Basics
2. Unwrapping a UV Space
3. Texture Mapping
Assignment 4 – Texturing C-Man
- Black background (-80 NA)
- Poorly framed movie (-1i0 NA)
- Poorly Composed Cameras (-1i0 NA)
- No audio (-1i0 NA)
- No shadow (-1i0 NA)
- No Go-Back (-1i0 NA)
- No Go-Through (-1i0 NA)
- UV Fragmentation (-1i0 NA)
- UV mapping (link to border of the UV space) (-1i0 NA)
- Too much texture stretching (-1i0 NA)
- No non-procedural textures (-1i0 NA)
- No procedural textures (-1i0 NA)

Project 1 – Environment
Video Lectures:
1. Real-Time vs. Pre-Rendered Animations
2. The Role of Compositing
3. Dynamic Observers
4. Pre-Production
5. Budget
6. Relationship Identifiers
P.B.L. Teams – Pipeline Assignment (Due. 13, A, & B)
Each student develops a visual style guide. Students break into P.B.L. Teams and pair one visual style guide from a number of different teams.

Module 8 – Visual Style Guides and Pipeline Checks
Video Lectures:
1. Real-Time vs. Pre-Rendered Animations
2. The Role of Compositing
3. Dynamic Observers
4. Pre-Production
5. Budget
6. Relationship Identifiers
P.B.L. Teams – Pipeline Assignment (Due. 13, A, & B)
Each student develops a visual style guide. Students break into P.B.L. Teams and pair one visual style guide from a number of different teams.

Rev. 01/30/2015 Page 107
## Common Transformation Models

<table>
<thead>
<tr>
<th>Classroom-based</th>
<th>Online/Technology-Based</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Linked Workshop</strong></td>
<td></td>
</tr>
<tr>
<td>In-class Lectures</td>
<td></td>
</tr>
<tr>
<td>Supplemental Workshops</td>
<td></td>
</tr>
<tr>
<td>Active Learning – group</td>
<td></td>
</tr>
<tr>
<td>Short, just-in-time lectures</td>
<td></td>
</tr>
<tr>
<td><strong>Scale-Up</strong></td>
<td></td>
</tr>
<tr>
<td>In-class Lectures</td>
<td></td>
</tr>
<tr>
<td>In-class Lectures</td>
<td></td>
</tr>
<tr>
<td>Active Learning – in lecture</td>
<td></td>
</tr>
<tr>
<td><strong>Supplemental I</strong></td>
<td></td>
</tr>
<tr>
<td>Technology-based interactive activities, simulations, and movies</td>
<td></td>
</tr>
<tr>
<td><strong>Supplemental II</strong></td>
<td></td>
</tr>
<tr>
<td>Technology-based interactive activities, simulations, and movies</td>
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<tr>
<td>In-class Lectures</td>
<td></td>
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<tr>
<td>In-class Lectures</td>
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<tr>
<td>Active Learning class</td>
<td></td>
</tr>
<tr>
<td>Online lectures &amp; activities</td>
<td></td>
</tr>
<tr>
<td><strong>Buffet</strong></td>
<td></td>
</tr>
<tr>
<td>Online lectures</td>
<td></td>
</tr>
<tr>
<td>Online lectures</td>
<td></td>
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<tr>
<td>Online lectures &amp; activities</td>
<td></td>
</tr>
<tr>
<td><strong>HyFlex</strong></td>
<td></td>
</tr>
<tr>
<td>Active Learning – group &amp; individual</td>
<td></td>
</tr>
<tr>
<td>Online lectures</td>
<td></td>
</tr>
<tr>
<td><strong>Flipped</strong></td>
<td></td>
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<tr>
<td>Reduced In-class Lectures</td>
<td></td>
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<tr>
<td>Web-based tutorials &amp; diagnostics</td>
<td></td>
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<tr>
<td><strong>Replacement</strong></td>
<td></td>
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<tr>
<td>Emporium</td>
<td></td>
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<tr>
<td>Interactive software and on-demand personalized assistance</td>
<td></td>
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<tr>
<td><strong>Fully Online</strong></td>
<td></td>
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<tr>
<td>Online Lectures, and Activities (group +/- individual)</td>
<td></td>
</tr>
</tbody>
</table>

Legend: Mandatory, Optional, Offline, Technology-optional, Technology-integrated, Technology-based, Hybrid/Blended
### Transformation Models

<table>
<thead>
<tr>
<th>Models which maintain traditional lecture</th>
<th>Models with an online focus</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Linked Workshop Model</strong>&lt;br&gt;The Linked Workshop model provides remedial/developmental instruction by linking workshops that offer students just-in-time supplemental academic support <em>(replacing previous non-credit developmental courses)</em> to core college-level courses.</td>
<td><strong>Emporium Model</strong>&lt;br&gt;The emporium model replaces lectures with a learning resource center model featuring <em>interactive computer software and on-demand personalized assistance.</em></td>
</tr>
<tr>
<td>Lecture Structure: Mandatory lectures&lt;br&gt;Active Learning Structure: Mandatory workshops on just-in-time supplemental activities&lt;br&gt;Online components: None</td>
<td><strong>Fully Online Model</strong>&lt;br&gt;The fully online model eliminates all in-class meetings and moves all learning experiences online, using Web-based, multi-media resources, commercial software, automatically evaluated assessments with guided feedback and alternative staffing models.</td>
</tr>
<tr>
<td><strong>Supplemental Model I</strong>&lt;br&gt;The supplemental model I retains the basic structure of the traditional course and supplements lectures and textbooks with <em>technology-based, out-of-class activities.</em> <em>(Reduced Number of Lectures)</em></td>
<td></td>
</tr>
<tr>
<td>Lecture Structure: Mandatory lectures&lt;br&gt;Active Learning Structure: None&lt;br&gt;Online components: Optional out-of-class, technology-based activities</td>
<td></td>
</tr>
<tr>
<td><strong>Supplemental Model II</strong>&lt;br&gt;The supplemental model II retains the basic structure of the traditional course and also changes what goes on in the class by <em>creating an active learning environment within a large lecture hall setting.</em> <em>(Active Large Lecture)</em></td>
<td></td>
</tr>
<tr>
<td>Lecture Structure: Mandatory Lectures&lt;br&gt;Active Learning Structure: Active learning within lecture hall setting&lt;br&gt;Online components: Optional out-of-class, technology-based activities</td>
<td></td>
</tr>
<tr>
<td><strong>Replacement Model I</strong>&lt;br&gt;The replacement model reduces the number of in-class meetings and replaces some in-class time with out-of-class, online, interactive learning activities. <em>(Reduced Number of Lectures)</em></td>
<td></td>
</tr>
<tr>
<td>Lecture Structure: Reduced lectures&lt;br&gt;Active Learning Structure: None&lt;br&gt;Online components: Mandatory out-of-class, interactive, technology-based activities</td>
<td></td>
</tr>
<tr>
<td><strong>Replacement Model II</strong>&lt;br&gt;The replacement model reduces the number of in-class meetings and also <em>makes significant changes in remaining in-class meetings.</em> <em>(Fewer and Different in-class meetings)</em></td>
<td></td>
</tr>
</tbody>
</table>
## Transformation Models

<table>
<thead>
<tr>
<th>Models with a combination of online &amp; classroom</th>
<th>Description with major defining characteristic bolded</th>
<th>Lecture Structure</th>
<th>Active Learning Structure</th>
<th>Online components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buffet Model</td>
<td>The buffet model customizes the learning environment for each student based on background, learning preference, and academic/professional goals and offers students an assortment of individualized paths to reach the same learning outcomes.</td>
<td>Optional</td>
<td>Optional</td>
<td>Optional technology-based activities</td>
</tr>
<tr>
<td>HyFlex Model</td>
<td>Presents the components of hybrid learning (which combines face-to-face with online learning) in a flexible course structure that gives students the option of attending sessions in the classroom, participating online, or doing both. Students can change their mode of attendance weekly or by topic, according to need or preference. This is not a self-paced model, even though online sessions can be either synchronous or asynchronous.</td>
<td>Optional</td>
<td>None</td>
<td>Optional technology-based activities</td>
</tr>
<tr>
<td>Flipped Model</td>
<td>Instructor-created video lectures and Interactive lessons, are reviewed by students before class. Class is used for working through problems and collaborative learning.</td>
<td>Videoed, watched before class</td>
<td>In-class interactive activities</td>
<td>Mandatory technology-based lectures</td>
</tr>
<tr>
<td>SCALE-UP Model</td>
<td>Specially designed active learning classrooms are used to facilitate small-group work. Lectures are typically 10-15 minutes Just-In-time. Focus is on active learning. May also use flip model for lecture.</td>
<td>None</td>
<td>In-class interactive activities</td>
<td>None</td>
</tr>
</tbody>
</table>
What is being said about student-centered learning?

“Virtually all these expert sources agree that science education should focus: less on what instructors "cover," and more on what students learn and how well they can use their knowledge; less on vocabulary and facts that students memorize, and more on students' understanding of scientific concepts and how those concepts fit together in a framework of knowledge about a subject; less on what students can repeat back immediately in class, and more on their long-term retention and ability to transfer their knowledge to contexts outside the classroom.” – National Research Council 1997, 1999a,b, 2000, 2002a,b 2003a,b

“Learners have different strategies, approaches, patterns of abilities, and learning styles that are a function of the interaction between their heredity and their prior experiences.” – NRC, 2003a, pp. 20-22

“No matter how discredited is the traditional lecture when used as a primary instructional approach, many faculty are confronted by students who resist new teaching strategies; presumably because it is harder work to understand than to memorize (Garvin, 2003); (Powell, 2003).

“91% of all statements referenced gains of various kinds. Among the most prevalent of these were: increased confidence in their ability to do research; improved ability to think and work like a scientist; gains in various skills such as problem solving, lab/field techniques, reading comprehension, working collaboratively; clarification/confirmation of career plans, and shifts to more positive attitudes toward learning or toward research.” – Seymour 2004

“Public understanding of science is appalling. The major contributor to society’s stunning ignorance of science has been our educational system. The inability of students to appreciate the scope, meaning, and limitations of science reflects our conventional lecture-oriented curriculum with its emphasis on passive learning. The student’s traditional role is that of a passive note-taker and regurgitator of factual information.” - Joel Michael (2006)

“There is substantial evidence that scientific teaching in the sciences, i.e. teaching that employs instructional strategies that encourage undergraduates to become actively engaged in their own learning, can produce levels of understanding, retention and transfer of knowledge that are greater than those resulting from traditional lecture/lab classes.” – Robert L. DeHaan 2005

“Interactive engagement of students in their own learning measurably enhanced the conceptual development and problem-solving abilities of the learners.” – Robert L. DeHahn 2005

“A growing body of science educators has found that students' attitudes toward science, their motivation for learning, and their conceptual development in the discipline can all be enhanced by engagement in real scientific investigations.” – Robert L. DeHahn 2005

“If we are persuaded by the evidence...that telling students what they need to know about a subject via lectures is not an optimal instructional strategy; if we are convinced that it leads at best to memorization of facts and algorithms, with little integration of new knowledge into the students' conceptual frameworks, then we must seek newer strategies that have been shown to help students achieve meaningful learning and transferable knowledge.” – Robert L. DeHahn 2005

"Not all students enjoy learning in this way. Some complain about the lack of a lecture. Almost all find themselves outside their comfort zone; they miss being told what to learn. But when pressed, many admit that they remember more from the astronomy course than from other, lecture-based courses, an impression corroborated by a course evaluation” - Robert L. DeHahn 2005

“Discussions ... are superior to lectures in improving thinking and problem solving.” - Wilbert McKeachie (1986)
“. . . it would be difficult to design an educational model that is more at odds with current research on human cognition than the one that is used in most colleges and universities.” - Halpern and Hakel (2002)

“Teaching cannot be reduced to formulaic methods and active learning is not the cure for all educational problems. However, there is broad support for the elements of active learning most commonly discussed in the educational literature and analyzed here.” - M. Prince (2004)

“Silent students are uninvolved students who are certainly not contributing to the learning of others and may not be contributing to their own learning” - K.A. Smith (n.d.)

What is urgently needed is an educational program in which students become interested in actively knowing, rather than passively believing.” – EP Volpe (1984)

“Student participation, teacher encouragement, and student-student interaction positively relate to improved critical thinking.” – Wilbert McKeachie (1986)

“A number of studies show that cooperative learning promotes more positive attitudes toward learning, the subject area, and the college than do competitive or individualistic learning.” - K.A. Smith (n.d.)

“Students will remember more content if brief activities are introduced to the lecture. Contrast this to the prevalent con tent tyranny that encourages faculty to push through as much material as possible in a given session. Similarly, the support for collaborative and cooperative learning calls into question the traditional assumptions that individual work and competition best promote achievement. The best available evidence suggests that faculty should structure their courses to promote collaborative and cooperative environments. – M. Prince (2004)

References


McKeachie, Wilbert; Pintrich, Paul; Yi Guang, Lin; and Smith, David. (1986). Teaching and Learning in the College Classroom: A Review of the Research Literature. Ann Arbor, MI: The Regents of the University of Michigan.


### Chart of Common Teaching Techniques

<table>
<thead>
<tr>
<th>Teaching Strategies Related to Group Size</th>
<th>Teaching Strategy</th>
<th>Possible Application of Teaching Strategies in the Three Domains</th>
<th>Level of Student Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Cognitive Low</td>
<td>Affective High</td>
</tr>
<tr>
<td>Group Size</td>
<td></td>
<td>Low</td>
<td>Low/High</td>
</tr>
<tr>
<td>Very large group (N=50+)</td>
<td>Lecture (passive or Interactive)</td>
<td>Low</td>
<td>Low/High</td>
</tr>
<tr>
<td>Large Group (N=20)</td>
<td>Lecture</td>
<td>Low</td>
<td>Low/High</td>
</tr>
<tr>
<td></td>
<td>Demonstration</td>
<td>Low</td>
<td>Low/High</td>
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<tr>
<td></td>
<td>Team Teaching</td>
<td>Low</td>
<td>Low/High</td>
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<tr>
<td></td>
<td>Discussion</td>
<td>Low</td>
<td>Low/High</td>
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<td></td>
<td>Debate</td>
<td>Low</td>
<td>Low/High</td>
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<td>Question &amp; Answer</td>
<td>Low</td>
<td>Low/High</td>
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<td></td>
<td>Video</td>
<td>Medium</td>
<td>Medium</td>
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<tr>
<td></td>
<td>Role-Playing **</td>
<td>High</td>
<td>High</td>
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<tr>
<td>Small Group (N=5-20)</td>
<td>Seminar</td>
<td>Medium</td>
<td>Medium</td>
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<tr>
<td></td>
<td>Laboratory/Workshop</td>
<td>Medium</td>
<td>Medium</td>
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<tr>
<td></td>
<td>Gaming/Quiz</td>
<td>High</td>
<td>High</td>
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<td></td>
<td>Brainstorming</td>
<td>Medium</td>
<td>Medium</td>
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<td></td>
<td>Buzz Group</td>
<td>High</td>
<td>High</td>
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<td></td>
<td>Field Trip</td>
<td>Medium</td>
<td>Medium</td>
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<td></td>
<td>Role Play</td>
<td>High</td>
<td>High</td>
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<td>Ice Breaker</td>
<td>High</td>
<td>High</td>
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<td>Simulation</td>
<td>High</td>
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<td>Case Study</td>
<td>Medium</td>
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<td>Each One Teach One **</td>
<td>Medium</td>
<td>Medium</td>
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<td>Three Step Interview **</td>
<td>Medium</td>
<td>Medium</td>
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<td></td>
<td>Think-pair-share **</td>
<td>High</td>
<td>High</td>
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<tr>
<td>Individual (N=&lt;&lt;5)</td>
<td>Project/Assignment</td>
<td>High</td>
<td>High</td>
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<td></td>
<td>Tutorial</td>
<td>High</td>
<td>High</td>
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<td></td>
<td>Open/Distance Learning</td>
<td>High</td>
<td>High</td>
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<td>One to One</td>
<td>High</td>
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<td>Information Learning Technology (ILT)</td>
<td>High</td>
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<td>Post-it/flipcard memorization **</td>
<td>Medium</td>
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<td></td>
<td>Process memorization **</td>
<td>High</td>
<td>High</td>
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** Activities added by Purdue IMPACT team members

To suggest additional activities, please email patreid@purdue.edu
Digital Storytelling

Prepared By: Dr. Constance Harris

Since the beginning of time, people have used storytelling as a mechanism as a means to instruct, motivate, provide situational context, articulate cultural values, and inspire others. Stories provide us with a toolkit that helps us complete tasks and/or solve problems, develop shared understandings with others, and also function as “an ‘expert system’ helping us to remember and integrate what we learn” (McLellan, 2006, p. 72). Storytelling has been viewed as an essential teaching tool in the k-12 and higher education settings, such as the humanities, social sciences, and philosophy (Abrahmson, 1998). When instructors share “real world” stories, students have the opportunity to construct new mental models about a topic within a given context, and reflect on their learning processes and experiences in their lives (Wang & Zhan, 2012).

Kapp (2014) stated that “different [learning] goals demand different types of stories. Matching the type of story with...instructional goals can help a learning designer craft the right story” (p. 10). The integration stories in the learning context should be guided by instructional goals. Alterio (2004) highlighted four types of stories that could be used for learning:

Expressive stories that teach or convey relevant information to someone else;

Strategic stories designed to encourage new ways of thinking and working and are often used in organizational contexts;

Reflective stories that highlight multiple perspectives or disparities in a given situation; and

Transformative stories used to promote a new vision for the future and encourage viewers to embrace that future.

An expressive story example could be that of a narrator sharing information about behind the founding of cities or creation of national monuments. For instance, a story the storyteller could explain how Washington D.C. earned the distinction as the nation’s capital or how national monuments, such as the Lincoln Memorial, came to be. Strategic stories are often used by business leaders to craft corporate message about a product brand and the role that brand plays in the lives of customers. Reflective stories could encompass those that address the necessity and dilemmas of the Affordable Care Act. Transformative stories could be those that describe how a student pressed through adversity and graduated from school.

What is digital storytelling?

Digital storytelling extends the manner in which people tell stories by allowing them to utilize digital multimedia, such as audio narration, video, images, podcasts, and music to communicate narratives in ways that are creative and compelling (Robin, 2006). (See Figure 1). These stories range from one to ten minutes (Clarke& Adam, 2010). Underlying theories which shape digital storytelling include constructionism, in which people learn by making personally meaningful artifacts that are to be shared with others; and narrative theory, which assumes that all forms of human communication can be seen.
as stories consisting of “symbolic actions – words and/or deeds – that have sequence and meaning for those who live, create, or interpret them” (Fisher, 1989, p. 58).


Digital storytelling applications include:

- instructional stories, used by teachers to convey instructional content (Robin, 2008).
- personal narratives, these stories may be autobiographical or focus on significant life events that hold personal meaning for the creator and viewer (Rossiter & Garcia, 2010).
- memorial stories, used to memorialize individuals or groups, such as veterans who fought in the Vietnam war (McLellan, 2006).
- e-portfolios, allowing students to document and reflect on their educational artifacts and learning experiences (Kearney, 2009),
- health and human services, describing pressing health and social issues (Miller, 2008), and
- interactive games, involving stories that challenge learners to think, explore, and solve problems that are complex and compelling (Liberman, 2006).

A brief history of storytelling
Although there are many technologies that can be used to create a digital story, digital storytelling is not a new concept (Robin, 2008). Clarke and Adam (2010) stated that “digital storytelling developed in a milieu of arts practitioners committed to the democratization of culture: to empowering and giving voice to individuals and groups traditionally silenced, marginalized, or ignored by mainstream culture” (p. 159). During the late 1980s, Joe Lambert and the late Dana Ashley helped establish the Center for Digital Storytelling (CDS) a non-profit community arts organization in Berkeley, California. The CDS continues to promote digital storytelling through training workshops designed to teach people how to create and share their personal narratives, consulting, and collaborations (Center for Digital Storytelling, 2014). The CDS is also known for developing and disseminating the Seven Elements of Digital Storytelling (Robin, 2006). These elements are used as a starting point in which to build digital stories. (See Table 1).
Digital storytelling in education

Digital storytelling has been found to be an effective tool for teaching (Bran, 2010; Lambert, 2002; Miller, 2008). Digital storytelling can be used by teachers to motivate students to learn new content, illustrate ideas and procedures, reinforce understanding of content, promote student innovation and creativity, personalize the student learning experience, facilitate student discussions, and help students comprehend difficult material (Wang & Zhan, 2012). Robin (2008) commented when students create digital stories, they have the opportunity to develop 21st century literacy (McLellan, 2006). The types of skills supporting the development of these literacies include:

- Research skills: requiring that students think critically and gather and document evidence for their story;
- Writing skills: analyzing the audience, story purpose, language, tone, drafting story ideas, and revising and editing stories;
- Technology integration skills: comprehending how and when to utilize technology in order to articulate their story (message);
- Teamwork skills: learning how to work collaboratively with others; and
- Assessment skills: learning to critically evaluate their own work and provide feedback to others (Malita & Martin, 2010).

Examples of Digital Storytelling in Higher Education

Researchers have found that digital storytelling positively affects student learning outcomes by encouraging them to clarify their own thinking and understanding in personally meaningful ways (Barrett, 2006; Clarke & Adam, 2012; Robin, 2006). (See Examples: Teaching with Digital Storytelling – Jennifer Shewmaker, Digital Storytelling – Teach for Every Student, What Is Teaching?, and Candids). Benmayor (2008) incorporated a digital storytelling assignment into her Latina Life Stories course. During the course, students were asked to read stories of resistance from the Latin American movement, create a story of identity, and then select a theory to frame their story. With a detailed analysis of a digital story created by one of the students enrolled in this course, Benmayor explained how this assignment enabled students to become aware of the social and cultural contexts that shape
their perspectives, helped demystify theory that could be used by students to inform expanded notions of cultural identity, and be used as a catalyst to promote cultural understanding and a sense of community in the course. (See “U Stories: Latina Life Stories”).

Kearney (2009) conducted a qualitative study in which 11 pre-service teachers volunteered to incorporate a digital story, entitled “What does it mean to me to be a teacher?” within their learning portfolio. In order to create this story, study participants collected artifacts from their campus and field experiences and created a narrative reflecting on what they had learned. Kearney found that creating digital stories enabled study participants to synthesize their experiences and creatively convey a coherent and personally compelling story when discussing their learning journeys. Further, creation of the digital stories enabled students to analyze, reevaluate, and inform their evolving understanding of their developing teaching practice.

Wang and Zhen (2012) described how they integrated a digital storytelling assignment into an undergraduate Chinese course, Mandarin Chinese IV. Students enrolled in this course were asked to create a story in which they incorporated Chinese vocabulary and sentence structures learned in and outside of class in their stories. The instructor held regular conferences with students so that they could begin to comprehend the nuances of the language and revise their scripts by listening to, speaking, reading, and writing the language. These conferences, along with continuous practice in pronunciations and intonations of texts embedded within their stories, helped the students become more fluent with the vocabulary and sentence structure.

Christiansen (2011) discussed a phenomenographic study in which 20 pre-nursing students were interviewed in order to examine the influence that digital patient stories had on their professional education (learning). This researcher found that the students experienced the stories in one of four ways:

- as a learning resource, in which they took a surface level approach to learning, not fully engaging with the patient story, focusing on the multimedia aspects of the story, and comparing the story format to that of text presented in books and journals;
- as an emotional experience, affected by elements of the patient story they viewed as relevant;
- as a reflective experience, in which the student took time to experience the story in a holistic way and subsequently develop new understandings of the situation presented in order to assess the complexity of the experience itself; and
- as a transformative experience, in which students took the opportunity to gain new insights about their professional identity and practice.

As a tool for transformative learning in nursing education, Christiansen argued that digital tools could be used a focal point for cooperative learning experiences. These experiences would allow the students to clarify misconceptions, develop critical thinking skills, and share and validate ideas that place patient care at the center of learning. (See Example: Hearing Patient Voices: Healing and recovery through digital storytelling).

These are just a few of the cases highlighting the use digital storytelling as a pedagogical strategy. Gils (2005) also highlighted several advantages of integrating digital storytelling into the courses: These
advantages include: (a) the opportunity for instructors to vary their teaching practices; (b) a more personalized educational experience for students; (c) the ability to present topics in a manner that is compelling and interesting; (d) creating stories that highlight authentic “real world experiences”; (e) the opportunity to engage students in the learning process; and (f) and promoting the use of active learning strategies in order to learn content.

**Constructing A Digital Story**

Kajder, Bull, and Albaugh (2005) recommended the following steps when creating a digital story:

1. **Create an initial script.** The script is designed to tell the story using the author’s own voice and allows the author to explore ideas and organize details, such as media elements. (See “How To Write A Script” or Create Script Google Site).

2. **Plan the project using a storyboard.** The storyboard allows the author to establish a plan for what will be displayed in the story, and encompasses elements such as,” narration, images, transitions, music and sound. A storyboard should be created BEFORE attempting to integrate any technology tools in the work. (See “How To Create Storyboards”).

3. **Discuss and revise the script.** Obtain feedback from others on the original script. This step provides students with the opportunity to articulate their ideas about the script and communicate what they want the script and images to convey.

4. **Sequence the images in the video editor.** This step encompasses scaling the images and making sure that the images have the appropriate format and resolution.

5. **Add the narrative track.** Students record the narratives in “chunks” for easier file management (See “Placed-Based Digital Storytelling Modules”)

6. **Add special effects and transitions.** This step is recommended only when the effects contribute to the meaning of the story. Additional time may be needed to add special effects and transitions to the timeline and make sure they are synchronized within the storyline: (See “Digital Storytelling Software”)

7. **Add a musical soundtrack if time permits.** This is the final step in story construction. Once the musical file has been imported into the video editor, the digital story can be rendered. The rendering process is used to compile all of the file elements, such as images, sound, and special effects, into a single stand-alone file. (See stories: “Digital Storytelling in Plain English”, “The Seven Elements of Digital Storytelling”).

**Challenges implementing digital storytelling in the classroom**

While many researchers have described the perceived benefits of utilizing digital storytelling as an instructional strategy, others have described some of the challenges instructors face when attempting to include this pedagogy in the classroom. These challenges include lack of access to hardware, software, and technical support; the availability of instructor training; the need for institutional support; and the availability of time to implement digital storytelling projects (Clarke & Adam, 2011; Dogan &
Robin, 2008; Sadik, 2008). Students also experience challenges when attempting to create digital stories.

Wang and Zhan (2012) noted that some students may be uncomfortable with digital storytelling assignments because these assignments require them to meld creative skill and technical ability. Students, such as adult learners, may not have had assignments requiring these competencies. Students also struggle with formulating with a script for their stories (Robin, 2006). Miller (2008) recommended that students use 4X6 notecards to help people write their scripts in a succinct manner. Narration has also been cited as a problem for students, because they do not like the sound of their voices (Wang & Zhan, 2010). One strategy students could implement is to have someone else narrate their story for them.

Other challenges students encounter has to do with timing and organization processes. Sadik (2008) commented that “the biggest challenge for students was the timing or tight integration between the audio and image tracks” (p. 500). This problem manifests itself when music the students use extend beyond the length of the video, i.e., the story was three minutes but the music segment was five minutes (Wang et al., 2010 ). An error such as this can be rectified by resizing the music segment within the timeline so that it matches the length of the story. Finally, organizing a digital story presents a challenge for learners. Some learners have a problem selecting a topic for their story (Landry & Guzdial, 2006) or constructing arguments that will support their story (Robin, 2006). These challenges can be addressed by obtaining feedback from peers and developing a storyboards to help them visualize their story and its structure (Ohler, 2005/2006).

**Conclusion**

This paper provides a brief overview of digital storytelling in education and highlights how this pedagogical strategy has been used to engage learners in different contexts. The most effective implementations of digital storytelling suggest that when instructors are taught how this tool can be used to complement existing curricula students experience several benefits. These benefits include the opportunities to transcend their own frame of reference, construct new meanings, build community with others, transform their personal and professional identities, and develop skills necessary for lifelong learning.

**Purdue Resources that Can Be Used to Create Digital Stories**

**Storyboards**
- Microsoft Word
- PowerPoint

**Applications**
- Camtasia Studio
- VoiceThread

**Faculty Examples of Storytelling**
- Colgate University: [ENST480 Interdisciplinary Investigations into the Environment](#)
- University of Maryland – Baltimore County: [Digital Stories in the Classroom](#)

**Additional Resources**

**Resources for Digital Storytelling**
- [Educational Uses of Digital Storytelling](#) (University of Houston)
  Includes examples of digital storytelling around the world, articles, research, Web 2.0 resources, and websites.
• **Open Thinking Wiki**
  Includes definitions, purposes, resources for developing stories, important resources, process information, media resources, and student examples

• **EdTech Teacher: Digital Storytelling in the Classroom**
  Includes a discussion of tools, media resources, and classroom integration ideas

• **Digital Storytelling: Tips and Resources** (Educause)
  A guide that includes a description of the strategy and sample rubrics

• **7 things you should know about...Digital Storytelling** (Educause)
  Learning aide describing the who, what, when, where, and why of digital storytelling.

**Blog**

• **Engaging Learners through digital storytelling: 40+ resources and tips** (Shelly Sanchez Terrell)

**Rubrics**

• **Generic Digital Storytelling Rubric**
• **Digital Storytelling Assignment** (University of Denver)

**Professional Development**

• **Fulbright – National Geographic Digital Storytelling Fellowship** (Fulbright U.S. Student Program)
• **Center for Digital Storytelling** (Berkeley, CA)

**References**


Quickly Gathering Student Feedback Techniques

**Minute Paper:**
The following is from Angelo & Cross, 1993
Students answer 2 questions: What was the most important thing you learned during this class? and What important question remains unanswered?

**Muddiest Point:**
The following is from Angelo & Cross, 1993
Students respond to 1 question: What was the muddiest point in class today? Well suited to large, lower division courses but not to those which emphasize integration, synthesis and evaluation

**Classroom Critical Incident Questionnaire**
The following is from Brookfield, n.d.:
Last 5-minutes, students answer the following questions:
- At what moment in class this week did you feel most engaged with what was happening?
- At what moment in class this week were you most distanced from what was happening?
- What action that anyone (teacher or student) took this week did you find most affirming or helpful?
- What action that anyone took this week did you find most puzzling or confusing?
- What about the class this week surprised you the most? (This could be about your own reactions to what went on, something that someone did, or anything else that occurs).

**Three open questions**
The following is from “Gathering and acting on feedback,” n.d.:
This strategy can be adapted to different modalities and purposes. There is nothing magical about the number three however this number of questions usually provides a manageable amount of feedback without taxing student or staff resources unnecessarily. This uses students’ individual written responses to open questions asked at the end of the class. The questions might be written on the board or an overhead transparency or they may be provided as an actual questionnaire. The questions you choose to ask will be determined by what you want to gather feedback on. However they are typically along the lines of the following:­

"What was the most useful thing you learned today?"
"What was the best thing about today's class?"
"How could I change my teaching to help students to learn more from this class?"

In some cases it might be appropriate to ask very specific questions such as;
"Which of the set pre-readings was most helpful in preparing for today's class?"
"How did today's computer learning task help you understand the concept of...?"

In larger classes the time required to read written responses from every student can be a barrier to using this technique. In such cases sampling procedures can be helpful. There are many ways to select a random sample of students. One simple technique is;
"Please pass these questionnaires along the row, could every fifth person take one and fill out the questionnaire. In a few minutes I'll ask you to pass your questionnaire back along the row to the end so I can collect them. While those people are filling out the questionnaire would the rest of you...."
Other techniques used include selection based on sub-groups in the class, for example "All those in a Tuesday tutorial group....". If sampling is used then the usual caveats apply in that there is only a probability that the results of your sample are representative of the whole population.

Group responses: An alternative to sampling in larger classes is to divide the class into groups of 5-10 students and collect the collated responses to the questions from each group of students after the individual students have contributed to a group discussion.

"I want you each to write down your answers to these three questions. In a few minutes I want you to discuss your answers in your groups. Once everybody has had their say I'd like one person in each group to write down their group's response to each question."

This technique is useful as it ensures discussion and some degree of consensus amongst the students before they respond. At the same time it streamlines the amount of feedback that the teacher has to read. In some settings, this technique can be equally well adapted to verbal presentation of group responses.

