Barbara gave me a great topic for this evening... I can talk about most anything! I am excited to see both science and mathematics educators here tonight as well as graduate and undergraduate students learning together.
This is an exciting time to explore the topic of technology in any classroom. For example, Education Week's 2009 Spotlight on Technology in the Classroom brings together a collection of articles hand-picked by the editors for their insights on:

**Students Turn Their Cellphones On for Classroom Lessons**
New educational uses of cellphones are challenging the bans many districts have adopted to prevent students from using the wireless devices on campus. January 6, 2009 – Education Week

**High-Tech Simulations Linked to Learning**
Experts say digital games can help students grasp difficult concepts, but warn against seeing them as 'silver bullet' solutions. April 6, 2009 – Education Week

**Virtual Field Trips Open Doors for Multimedia Lessons**
Electronic visits grow as schools cut back on off-campus excursions to save money during tough economic times. February 10, 2009 – Education Week

**Breaking Away From Tradition**
As the world of online education continues to evolve, brick-and-mortar schools are incorporating digital curricula and virtual teachers into their classrooms in ways that have surprised even the advocates of the online education movement. March 20, 2009 – Education Week

**Hunting the Internet for Quality Content**
Teachers looking for lesson plans, worksheets, videos, and multimedia activities for their daily classes can find plenty of materials on the Internet. March 20, 2009 – Education Week

**Networking Teachers Coaxing Colleagues to Use Technology**
The Discovery Educator Network offers hundreds of webinars, blogs, meetings, and workshops to help explain and show how various devices and applications work and ways to adapt them to the curriculum. September 5, 2008 – Education Week

**Learning on the Ride**
A pilot program in rural Arkansas that uses mobile Internet technologies has caught the attention of educators and ed-tech enthusiasts around the country. January 16, 2009 – Digital Directions

Retrieved March 1, 2010 from
So, since we only have an hour, I thought we’d explore these few important social media sites... *Just kidding!*

One of my main concerns in teaching about technology is information overload:
1. not causing it in my electronic lessons which are easy to add to and,
2. helping students discover ways of dealing with it that work for them individually.

So, tonight I hope to
• tell you a little bit about my research,
• show you a little bit about my teaching, and
• send you home with a few new links that might come in handy at some point.
My journey to date...

- Science educators online...
- Training at TeleCampus...
- Field trips online...
- Merging theory and practice...
- Keeping up with ‘IT’...
- Taking them to the top!
- Maintaining a balance...
- Taking them to the top – again!
- Realizing the potential...
- Ed Tech redesign...

 Quickly, just to give you a frame of reference, here’s a snapshot of what I’ve done as an educational researcher and science educator... I apologize in advance for my inherent bias toward science teaching. The same principles and concepts I’ll mention apply equally to technology-supported mathematics teaching.

I started my master’s work in 1997 by looking at science educators online... My thesis, titled ‘What Educators Want from the World Wide Web’ showed that this thing called the Internet was probably a good thing that was probably going to last a while!

In 1999 my association with the UT-TeleCampus, our system’s centralized distance education provider, began with faculty training since I was challenged to put my Ed Tech course online as a pilot test. I’m still teaching that same course pretty much as is today!

By 2000 I had started my doctoral work at Curtin University of Technology by looking at online field trips... That’s where I got the idea to try to merge educational theory and scientific practice through strategic applications of technology.

All of that background is available in my digital thesis, Virtual Field Trips: Using Information Technology to Create an Integrated Science Learning Environment (or ISLE), that was passed officially in 2002. Whew!

With my doctorate finally in hand, I caught up with the advances in information technology by creating MT SCIENCE, Mobile Technology for teaching and learning SCIENCE in the real world. This is a collection of electronic probeware that we needed, first, to learn how to use, and second, to figure out how to help our teachers figure out how to use these new tools with their classroom students.

In 2004, it all came together in my first Teacher Quality program called Taking them to the top! Cultivating an ISLE with applications of IT and environmental education.

Needing a break in 2005, I put together a summer workshop that used Project WILD activities and those PASCO probes to raise awareness of air quality.

Then there was a second Teacher Quality cohort that completed a slightly different year-long program based on the first implementation.

After 5 years of proposals, I finally got to realize the potential I saw back at the beginning by designing, producing, and helping to deliver the Master of Arts in Teaching - Science Education Online! that launched in Fall 2006.

Most recently, I’ve rewritten the required Ed Tech course for the Teacher Development Center to address new and emerging technologies rather than the ‘traditional’ skills of word processing, spreadsheets, and presentation software.
Across all of those projects, I’ve researched the **technology-infused learning environment**.

Referring “to the social, physical, psychological, and pedagogical contexts in which learning occurs and which affect student achievement and attitudes” (*Fraser, 1998*)

- Is the class dominated by the teacher or is it student-centered?
- Do students actively participate in class or sit and listen?
- Do students cooperate and discuss with each other or do they work alone?
- Is the teacher supportive and approachable?

FYI, UT-Dallas subscribes to *Learning Environments Research*, an international journal dedicated to this burgeoning field.

You can read more about how I used the Constructivist Learning Environment Survey to evaluate various programs in the handout – a chapter in the *Second International Handbook of Science Education* which will be available this fall. Note the relevant reference list in your advance copy of my chapter on evaluating science classrooms in particular!

Notice how the 5 scales of the CLES can be matched to the goals for educational reform in science as stated in the National Board for Professional Teaching Standards.

Similarly, the 5 scales of the CLES can be matched to pedagogical aspects of information and communication technology use in science education as described by Webb.

The really neat and powerful thing about learning environments research is its scalability. Many available instruments have been used in a lot of subject areas, in a lot of countries, and at a lot of different grade levels by hundreds of researchers, thousands of teachers, and millions of students around the world in a lot of unique designs.

Teachers can use them easily to get useful information to improve what they’re doing with their students.

This can help you adjust your practice as science, mathematics, and technology continually advance!
**Ed Tech learning environment**

- Attitude
  - toward your subject area and technology,
- Knowledge
  - about your subject area and technology,
- Experience
  - with your subject area and technology (what works),
- Hardware
  - for your subject area and technology (what they have/need),
- Support
  - ideas/tips for integrating your subject area and technology.

*Back to technology in the classroom...*

Five principal factors influence the overall 'educational technology' learning environment:
1. Attitude - toward your subject area and technology,
2. Knowledge - about your subject area and technology,
3. Experience - with your subject area and technology (what works),
4. Hardware - for your subject area and technology (what they have/need),
5. Support - ideas/tips for integrating your subject area and technology.

Thanks in large part to the lifelong work of Barry Fraser, student perceptions of the learning environment have been correlated to student achievement.

“Performance on standardized assessments in reading, writing, mathematics and other subjects improves when technology is part of the learning process. Integrating technology into academic subjects results in gains on high-stakes tests that enable schools to meet Adequate Yearly Progress (AYP) and performance benchmarks under NCLB. A 2004 report by Market Data Research found that schools that fail to meet the AYP requirements are below average in technology use. “
(http://www.edtechactionnetwork.org/ed-tech-and-student-achievement)
So let’s get a sense of your attitudes toward new technologies!

The National Staff Development Council put together a survey called *What a district leader need to know about new technologies* and proposed that it be used to stimulate conversation among district staff or within school buildings about their level of comfort with new technologies. Parents represent another group that might be surveyed.

*See www.nsdc.org for more information.*
That same survey is how we start the online Ed Tech course! Here’s an excerpt from the first lesson in ED4372. Each week I summarize the class results of an opening survey and post them to a group discussion board for comment. The students like to know where they stand in relation to their peers. This is one way I try to create a sense of personal relevancy and raise their comfort level.

As noted by Egbert (2009), teachers want to hear that their instruction is "fun, interesting, engaging, effective, meaningful, crucial, powerful, empowering, real" (p. 3).

Technology can help you meet these goals. **Your personal attitude** toward technology and change (new technologies or progress), is probably the number one factor in how your students will perceive your classroom. That impacts directly on how they will behave, perform, and achieve in your classroom.
Now I’m ready to add a subtitle to this presentation: *keeping pace or setting the pace?*

It’s up to us – you and me – to maintain a **learning focus** to supporting learning with technology!

Technology is a tool that teachers can use to support learning, but learning must be the goal.

The key determinant of our success will not be the number of computers we have or the masses of cables installed, but how we define the educational use of the technology, how we support teachers, how we design the curriculum, and ultimately respond to a changing world.
As science/mathematics educators, you well know the power of experiential training and can’t help but lean toward inquiry-based constructivist teaching practices if you’re in a UTD program. So let’s have some fun while we are face-to-face!

ACTIVITY (A):

1 **scribe** to list responses

10 **participants** to toss
- Coolest technology?
- Repeat.
- Reverse!

*What did it look like? Sound like? Feel like? From your perspective?*
For comparison, THE journal (Technological Horizons in Education) listed these 14 Technologies Educators Should Watch in 2010

Tech vets picked the latest tools they think can improve instruction, boost productivity, or just help make users' lives a bit more organized.

The pertinent trends that jump out to me from this - and from other sources - are:
- Interactivity
- Productivity
- Portability
ACTIVITY (B):

1 scriber to list responses

Other observers to brainstorm
• most passionate professional concern

How might this model help in your practice regarding technology?

Back to present capabilities, this is how I present the activity in the completely online Ed Tech class that is required for students seeking certification through our Teacher Development Center.
Video snippets and PDF instruction sheets of all of the activities are available on my faculty website for use after the course ends. You’re invited to check them out and use them too!

My contact information and an overview of the Ed Tech course can also be found there.
Because I use those same starter activities all of the time but in different contexts, they could be considered reusable content objects or learning objects.

The way I put them on my faculty website not only makes that easy for me but also accessible to my students after the semester ends and they lose access to the secure course management system. Basically, I use my faculty website as my personal repository!

SCORM stands for **Sharable Content Object Reference Model** and represents one format for sharing learning objects.

As explained by David A. Wiley: "The main idea of 'learning objects' is to break educational content down into small chunks that can be reused in various learning environments, in the spirit of object-oriented programming" (Connecting Learning Objects to Instructional Design Theory)

*Find a couple of sites that fit your needs (lessons, remediation, extra credit, make-up work, etc.) or find out if your district licenses any similar resources - and use them! RSS feeds are a great way to keep up if you are selective...*
Of course, there are many other things going on that will impact on all learners if they haven’t already! How many of you use...


1. **Social software**? Fears of security, safety, cheating, bullying, and other inappropriate uses have found many schools banning social software sites. However, we have found that students learn about classes, plan daily activities, and even get tutoring through such tools. **Students report that they value schools being willing to “meet them where they are” and with tools they are already using.**

2. **Games and simulations**? Although there is a lot of bad publicity about violence and video games, research tells us: a) games and simulations consume a significant portion of the life of an average student; b) games and simulations can positively motivate students to learn; and c) **games and simulations can encourage and support both teaching and learning.**

3. **Interactive learning environments**? Innovative schools have begun to expand their practice to consider education in virtual worlds. Early research has demonstrated engagement in spatial electronic worlds can not only enhance collaboration, but it can also have **important outcomes for content skills like mathematics** (Kaufmann et al., 2003).

4. **Delivery mechanisms**? Social software, games, and innovative delivery methods like PLEs and virtual worlds all focus on the method of delivery. But it is also important to focus on the reception of content. Most of the traditional methods and even the innovative methods **still focus on the student sitting at a desktop** or laptop computer.
And, like it or not, we’re going to see a rapid increase in full-time, multi-district programs in K-12 education.
*Keeping Pace* now counts 45 of the 50 states (plus Washington D.C.) as having a state virtual school or online initiative, full-time online schools, or both.

Accompanying the recent growth in these opportunities is increased demand for online learning. Survey results from *Project Tomorrow* suggest that students’ interest in and demand for online learning options is higher than the opportunities that they have in many states.
If you want to try your hand at pulling together some reusable content objects to be delivered online, check out HippoCampus!
You can try to keep up, and might even get ahead in some areas, but the cycle is infinite!
In 2009, at a conference for Canadian educators, Dr. Ellen Wagner made the case for instruction being more than good pedagogy and good instructional design. You can’t not have that.

Being able to make things more relevant might actually be a part of a design of some competencies that we have to develop as we go forward in this new world where it's not just us talking to one another in our classrooms.

These are her ‘Lessons eLearned’:
1. None of us can DO learning to another human being - even though we talk about it all of the time! It is a deeply personal act facilitated when experiences are relevant, authentic, and engaging.
2. Different kinds of learning demand appropriate strategies, tools and resources. There is not such thing as a 'one size fits all' technology solution for learning.
3. Technology doesn't necessarily guarantee better learning... BUT, it can focus attention, give people a chance to participate, and to develop a personal relationship with information that maybe we never realized before.
4. The better the experience, the greater the likelihood that learning will occur. Leveraging the technologies that we have available to us, that you use every day, can have a direct positive effect on learning.

Rules for engagement:
1. Capture their attention.
2. Convince them to care.
3. Motivate them to change - the definition of learning.
4. Give them choices.
5. Connect them with community - people like them, who care about what they care about and can support/nurture/inspire them.
6. Induce them to participate.
7. Enable opportunities to contribute - to negotiate new knowledge (it matters more than money in a job situation).
8. Make it an experience to remember.
A critical component of the Ed Tech course is the 3-part development of an individual project. I use the Calibrated Peer Review system at UCLA to provide feedback on the following tasks:

1. **Proposing** a technology enhancement in the form of a memo
2. **Implementing** a technology enhancement as a detailed timeline
3. **Sustaining** a technology enhancement presented as a 7-minute pitch

Then their final exam is a project summary submitted in the form of Gowin’s Vee. This is a handy tool for problem-solving that can be used with almost any age if you’re not familiar with it. I hope that my students will remember to think through these items as they consider technology use in their own classrooms. It’s not as easy as it looks!

Ultimately, one question leads to an answer that leads to another question and so on... That’s what we call the ‘parade of Vees’.

My advice is to take one step at a time. The great thing about educational technology is that you don’t have to try everything at once. In fact, I advise against it. There are so many other factors – including those outside of your classroom – that impact on learning. You only can control your teaching. This is another tool to help with that, like the learning environment surveys.
You’re not alone and you may not have much of a choice, but you can choose and do change how learning happens in your classroom. Take advantage of all that’s available to you.

**Do what you love, love what you do!**

Barry Fraser and Jane Kahle’s (2007) secondary analysis of 1995-1997 data from Statewide Systemic Initiatives found that “the classroom environment (defined as the use of standards-based teaching practices) accounted for variance in both achievement and attitudes scores over and above that attributable to either the home or peer environment” (p. 1905).

The traditions of learning environments research provide a common language and promising methods to meet the new challenges facing educators and researchers in science and education in a technology-rich world. **The literature resoundingly states that the crucial component of teaching and learning is the teacher and his/her pedagogical approaches.** Fortunately, these ISLE studies and other similar investigations, indicate that today’s university and school teachers are making a positive difference in science education.
And remember that your students may have been your biggest supporters all along...

**YouTube** | Lost Generation
http://www.youtube.com/watch?v=MWSYPDh7O5Q