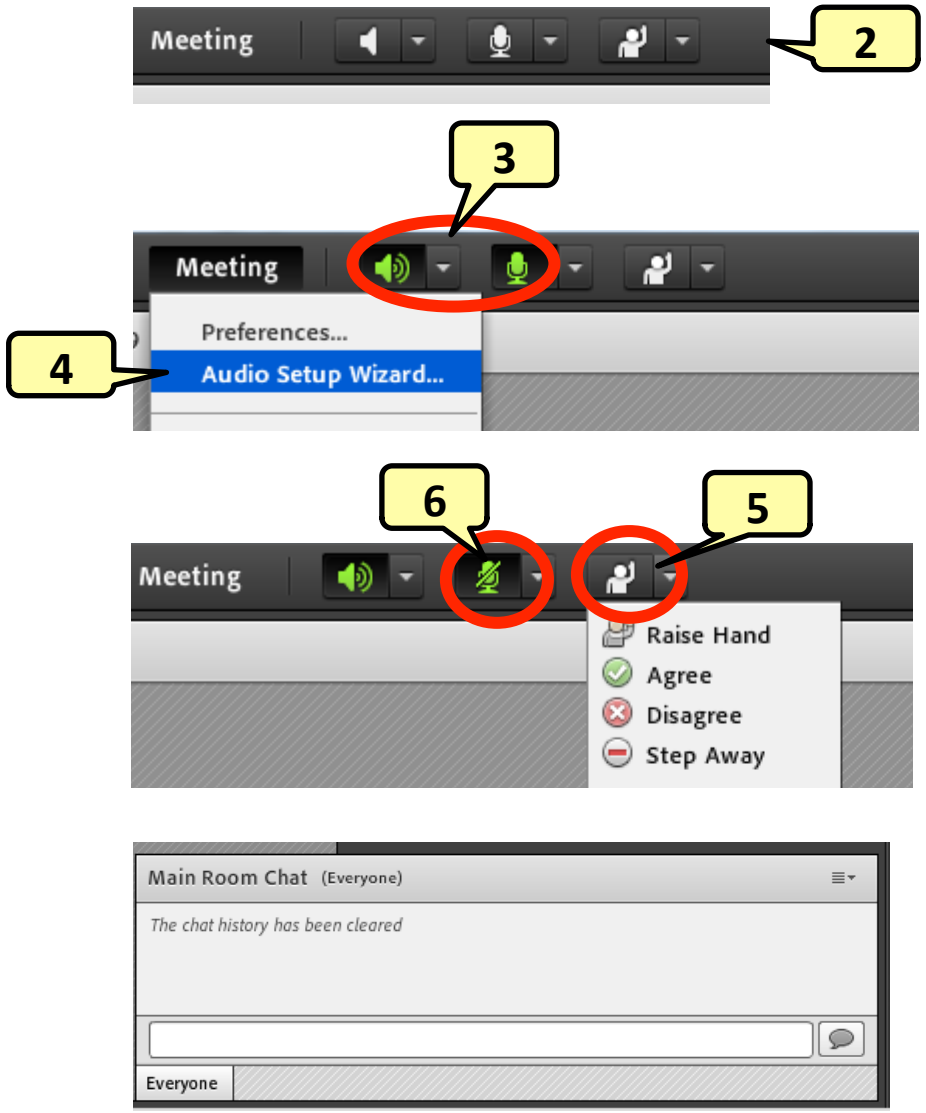
Welcome! As you enter the room, please…

1. Plug in your headset (if available).
2. Familiarize yourself with the **top bar** on the screen
3. Make sure your **speakers and mic are enabled** (the icons on the top bar should be **highlighted in green**).
4. Run the **audio setup wizard** (this option is available from the "Meeting" menu on the left right of the screen).
5. Once you have run the wizard, "**raise your hand**" by clicking on the icon available on the top bar. This will indicate hosts you are ready to test your mic.
6. After testing your mic, **mute yourself** by clicking on the mic icon on the top bar (this will help to avoid background noise).

Note: Feel free to use the chat at any time!



Record the Session

Mechanics VCP Session 7
May 16, 2013

STEPS FORWARD, EDUCATIONAL RESEARCH, WRITING GRANTS AND PAPERS

<u>Agenda</u>:
(i) Objectives for today's session
(ii) Next Fall – schedule and your goals
(iii) Educational research and assessment
(iv) Writing grants and papers

A Party!

Brian

- **an ASEE in-person gathering for ALL VCP participants!**
- **When: Monday June 24, 12.30-2 pm**
- **Where: Omni Center Hotel, Willow Board Room**
- **learn more about the ASEE Annual Conference:**

http://www.asee.org/conferences-and-events/conferences/annual-conference/2013

Tentative Plan for Fall 2013

Brian

- **during Fall 2013, we are planning a set of sessions focusing on helping you use research-based practices in your teaching**
- **in the coming week, we will ask for your input about how to structure the sessions (content, timing etc.)**
- **we also need you to post your Fall 2013 implementation plan (your "three new things" plan) so that we can use that information to shape the sessions as well**

Session 7 Learning Objectives

Brian

- **At the end of this session, participants will be able to:**
  - ***Establish goals for next Fall (quarter or semester)***
  - ***Discuss methods of educational assessment***
  - ***Develop research questions that can be used for a paper or a grant***

Blog posts

Brian

- **Multiple choice/concept questions**
  - **Amelito posted some refs for statics**
  - **Good measure of understanding? (Steve)**
  - **Some recommendations**
    - **Write the stem as a question, not a fill in the blank**
    - **Pull distractors from student open-ended responses**
    - **Make all answers about the same length**
    - **Really only need 3-4 answers – never go >5**
    - **Careful with "none of the above" or "all of the above"**
    - **Avoid extremes ("never", "always", "only")**
    - **Avoid using negative questions ("Which is NOT…")**
    - **Use only one correct option**
    - **Try as formative assessment before place on a test (Anna)**

Blog posts

Brian

- **Flipped classroom**
  - Talking head example (Anna)
  - Parts of it are really a physical demonstration, similar to what we discussed during the second part
  - Also some nice resources posted
- **Assessing – small classes, no control, etc**
- **What tools for drawing diagrams?**
  - Open Office: Draw program; scan figures from texts, use free graphics program GIMP
- **Collection of homework and test problems?**

How Learning Works*

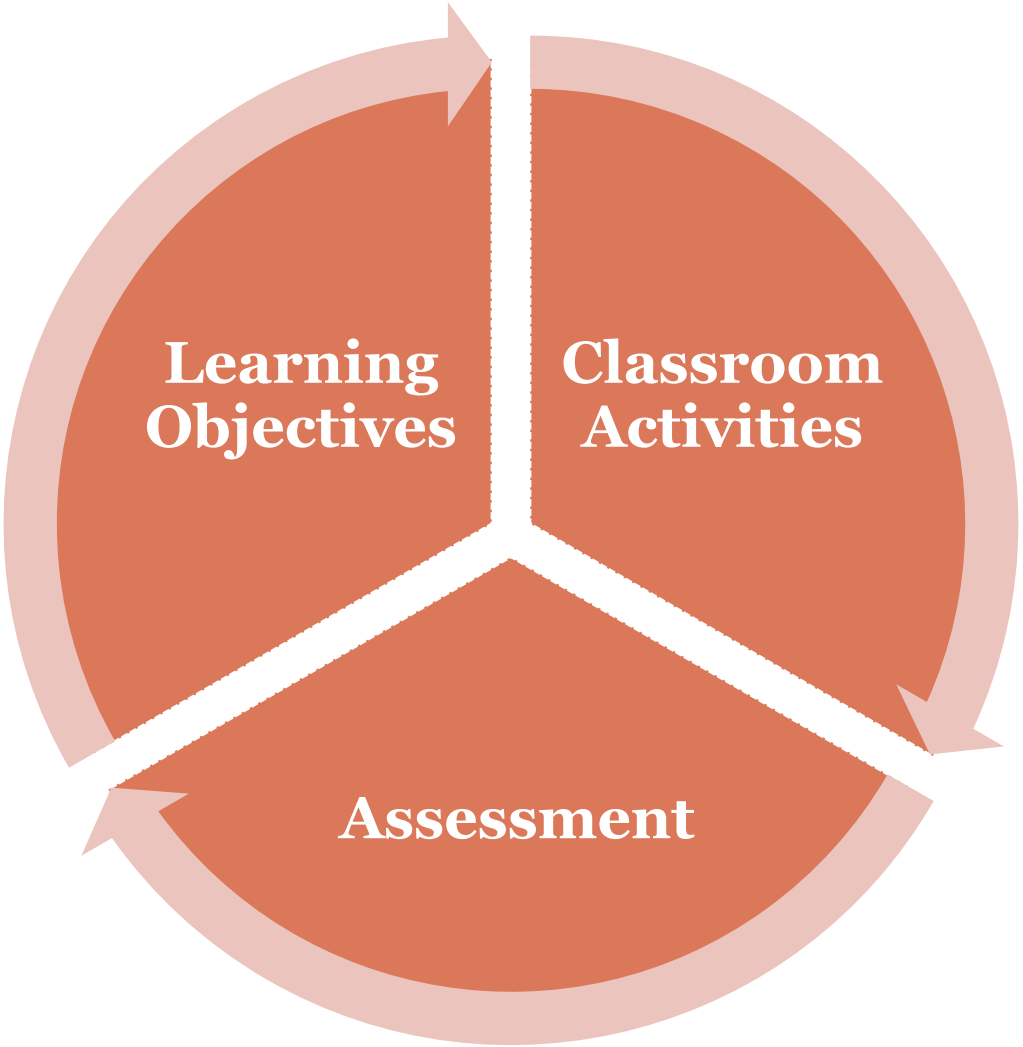
Brian

1. **Students' prior knowledge can help or hinder learning**
2. **How students organize knowledge influences how they learn and apply what they know**
3. **Students' motivation determines, directs, and sustains what they do to learn**
4. **To develop mastery, students must acquire component skills, practice integrating them, and know when to apply what they have learned**
5. **Goal-directed practice coupled with targeted feedback enhances the quality of students' learning**
6. **Students' current level of development interacts with the social, emotional, and intellectual climate of the course to impact learning**
7. **To become self-directed learners, students must learn to monitor and adjust their approaches to learning**

*Ambrose, Bridges, DiPietro, Lovett, and Norman, *How Learning Works* (2010)

Course Alignment

Brian



Goals for the Fall

Brian

- **Some of your examples:**
  - **Group Project: I plan on introducing a group project for statics.**
  - **Student-generated videos explaining concepts/ illustrative examples**
  - **Improve my assessment of students, particularly to assess high-order skills such as problem solving.**
  - **Lots of discussion on flipped classrooms**

Breakout Session

Brian

- **What three things do you want to try next time you teach mechanics?**
- **What things might hinder your attempts?**
- **What can you do to overcome these obstacles?**
- **What assistance would help you achieve your goals?**

Two Polls

Ed

- **Have you written any educational research papers or proposals?**

NRC Research Principles

Ed

- **Scientific research in education contains:**
  - ***Question*: significant question that can be investigated empirically**
  - ***Theory*: grounding theory in how people learn**
  - ***Methods*: that permit the most direct investigation possibly of the question**
  - ***Reasoning*: a clear chain of reasoning leading from evidence to conclusions**
  - ***Generalization*: to the extent possible, a way to generalize the results across studies**
  - ***Dissemination*: to an interested community**

NRC 2002, *Scientific Research in Education*

Research Questions…

Ed

- **Identify a desired outcome**
- **Propose an intervention**
- **May define a context or environment**
- **Suggest measureable metrics**
- **Ex: Can *using problem-based learning techniques* in a *core sophomore lecture course improve persistence/retention of under-represented groups* in Mechanical Engineering?**

Research Questions Can Be About…

Ed

- **Academic outcomes (ability to solve problems, preparedness for future courses, etc.)**
  - **Learning outcomes for a course**
  - **ABET (a)-(k) type outcomes**
  - **Bloom higher-order outcomes**
- **Motivation or attitude**
- **Retention**
- **Institutional/organizational issues**
  - **Impact of tutoring programs**
  - **Impact of advising structures**
  - **Impact of peer networks**

Research Questions Should Be…

Ed

- **Driven by an identified need (in your class, your institution, or nationally)**
- **Grounded in the literature (what have other researchers done?)**
- **Underpinned by a theory of how learning works**
- **Answerable with either existing data or data that you plan to collect**

Building a Question

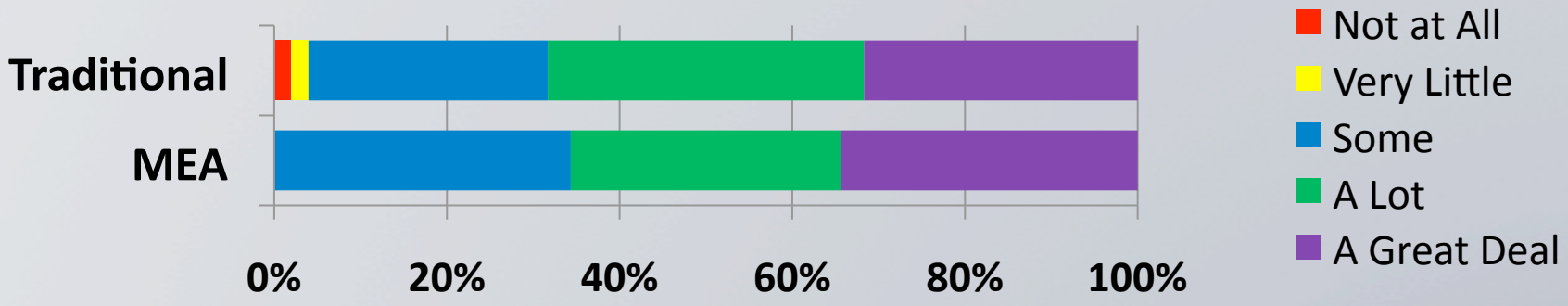
Ed

- **Establish the need – mechanics courses**
  - **Discuss retention, traditional methods don't seem to resonate with under-rep groups**
  - **Large number of students take these classes**
- **Research question**
  - **Are physical demonstrations good? (Too broad)**
  - **Do physical demonstrations increase student motivation? (Better, measurable)**
  - **Do physical demonstrations increase student conceptual understanding and improve student attitudes towards statics? (Even better)**

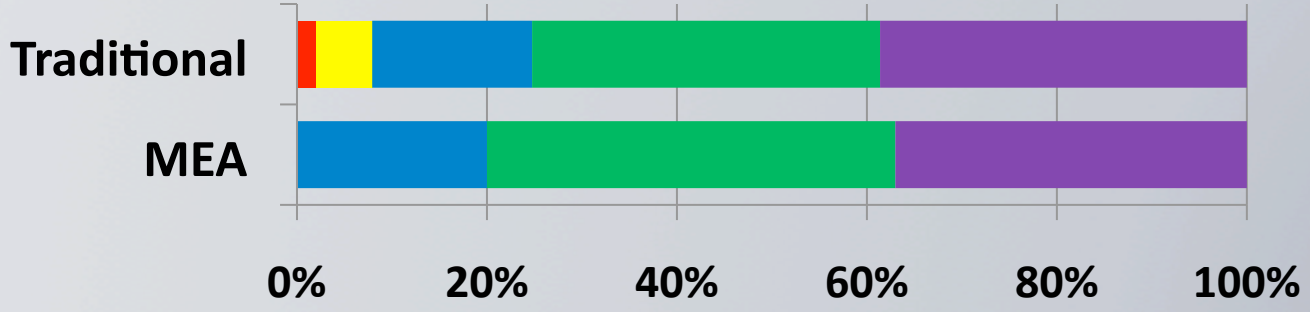
Evaluation Example

This course improved my…

- Ability to use math concepts to solve engineering problems



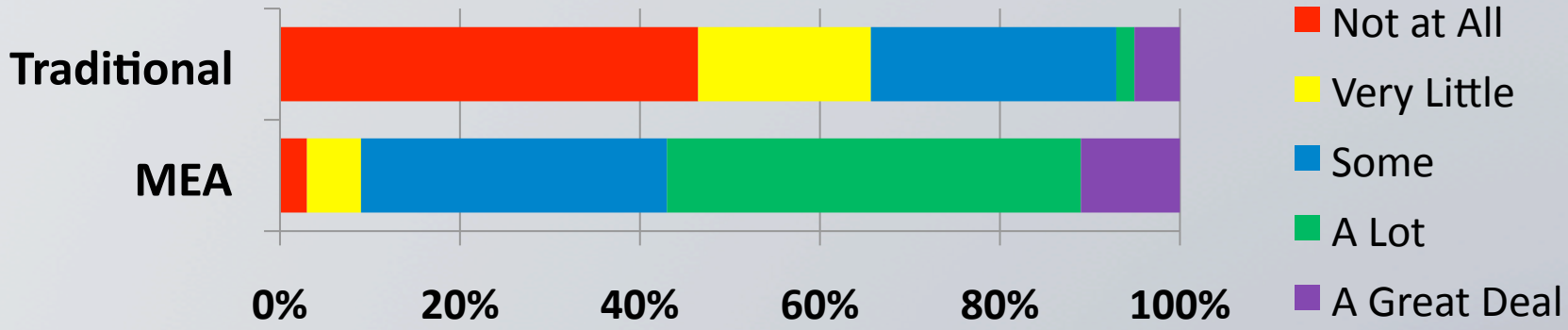
- Ability to formulate and solve engineering problems



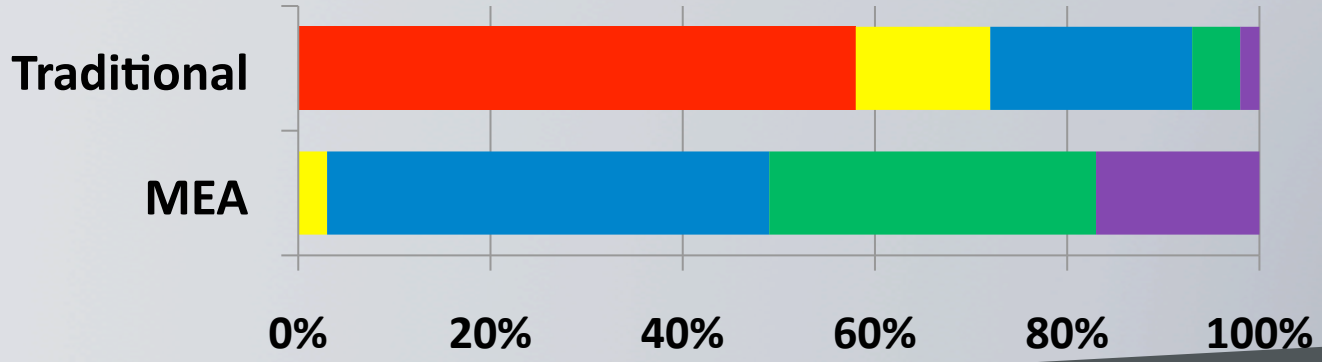
Evaluation Example

This course improved my…

- Ability to function effectively in different team roles



- Ability to design a device or process to meet a stated need



Methods and Approaches Should Be…

Ed

- **Clearly defined, with an estimated timeline**
- **Compliant with institutional standards on treatment of human subjects**
- **Detailed in terms of data collection and analysis**
- **Optimally aligned with the expertise of your research team**
- **Grounded in a theoretical framework (from HLW, cognitive science, educational psychology, etc.)**

Assessments Can Be…

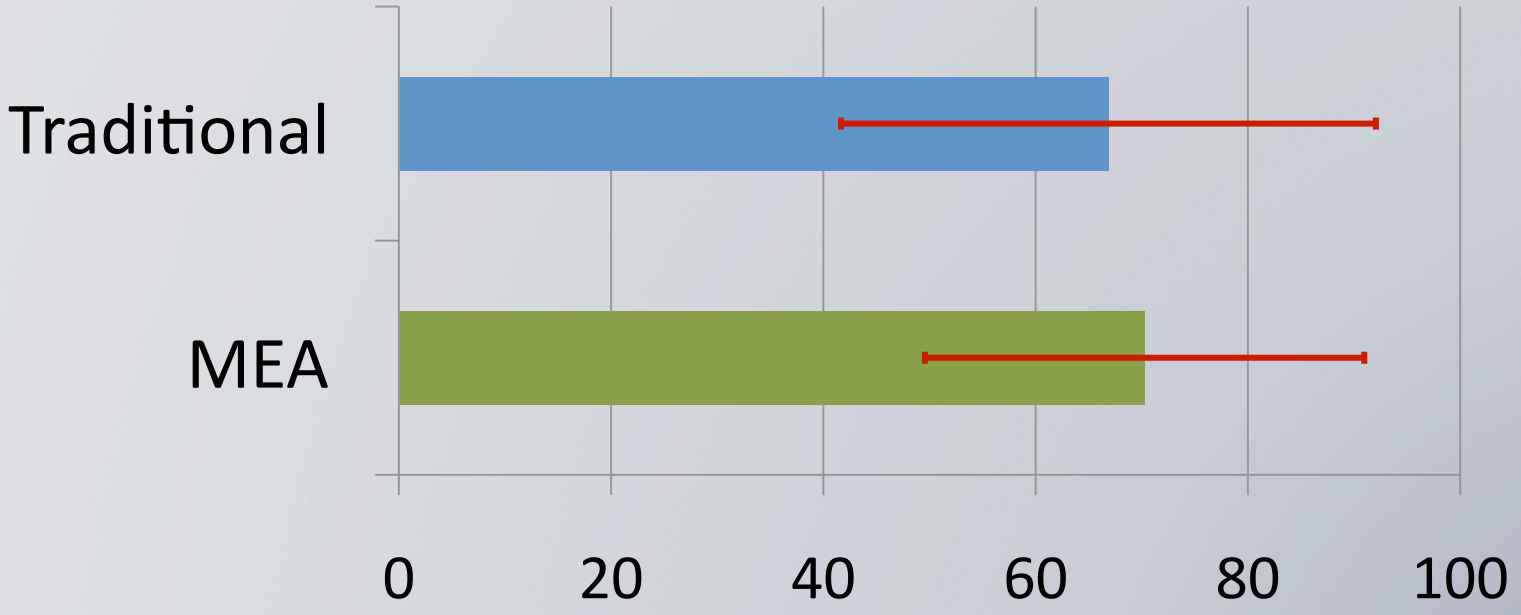
Ed

- **Quantitative:**
  - **Tests, quizzes, homework**
  - **Surveys, download data**
  - **Peer ratings, faculty ratings**
- **Qualitative:**
  - **Interviews**
  - **Focus groups**
  - **Observations**
- **Mixed-method: some combination of quantitative and qualitative**

Evaluation Example

Final Exam Scores

- **Dynamics Common Final**



Assessments Can Target…

Ed

- **Specific learning activities and outcomes:**
  - **Keep assessment activities throughout your courses**
  - **Scan quizzes, have students submit projects electronically, give online quizzes, clickers**
- **Conceptual understanding:**
  - **Concept Inventories**
  - **Validated instruments when possible**
- **Affective qualities:**
  - **Subjective surveys (i.e., attitudes)**
  - **Self efficacy**
  - **MBTI, Learning styles (both a little outdated)**

Let's Discuss Your Experiences

Ed

- ***What are some assessment techniques you have used in your classes?***

On Low-N Studies

Ed

- **Both a challenge and an opportunity**
- **Quantitative challenge: statistical significance**
- **Qualitative opportunity:**
  - **Interview every subject?**
  - **Focus on role of environment or peer network?**
  - **Small class may take place in a "small" institution, or with a specific student population**
  - **You can deploy certain interventions in small classes that are not feasible in large ones**

NSF Resources for Project Evaluation

Brian

- **Page 7 of PDF on the portal**
- **The 2002 User-Friendly Handbook for Project Evaluation**
- **User-Friendly Handbook for Mixed Method Evaluations**
- **Online Evaluation Resource Library (OERL)**
- **Field-Tested Learning Assessment Guide**
- **Student Assessment of Learning Gains**

Accessing Expertise

Brian

- **if your institution has a School of Education, there is tremendous expertise there**
- **statisticians (grad students)**
- **local institutions with other capabilities different from your own**
- **external consultants ($!)**

Let's Discuss Your Experiences

Brian

- ***What difficulties have you had when trying to write your papers?***

By the end of the week

Brian

- **Based upon your MVCP experience, *think of three concrete new teaching ideas/ techniques/activities that you plan to implement in your course next term*, and upload them to the folder Session 7>New ideas**
- **Let us know the barriers to your success, and what the MVCP might be able to do to help you succeed**