Strengthening Learning for the Future: The Influence of Assessment and Feedback

Presented by

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Thomas L. Friedman

New York Times 11 September 2014

[ ] of Provosts surveyed by Gallup thought their schools were successfully preparing young people for the workplace

When recent college graduates were asked whether they felt prepared, [ ] say "yes"

When business leaders were asked whether they are getting enough college graduates with the skills they need [ ] strongly agreed

Friedman: "More than a skills gap. It is an understanding gap."

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96% of Provosts surveyed by Gallup thought their schools were successfully preparing young people for the workplace

When recent college graduates were asked whether they felt prepared, only 14% say "yes"

When business leaders were asked whether they are getting enough college graduates with the skills they need only 11% strongly agreed

Friedman: "More than a skills gap. It is an understanding gap."

On-the-Job Training
Richard Felder, CEE 2008

Sheila: Good morning, Reggie—great to have you with us. I'm Sheila Conner, head of Process Engineering.

Reggie: Nice to meet you.

S: I was really hoping you'd join our group—I saw your file and you don't see 3.9 GPAs every day, especially coming from your university.

R: Thanks. I'm looking forward to using what I learned there.

S: Well, you'll get plenty of chances to do that here. As they probably explained to you, we get involved in almost everything that happens in the plant—designing new processes and products, retrofitting, troubleshooting, you name it. How does that sound?

R: Um, good, I think. I just took plant design last spring, so I'm probably more up on that than on that other stuff.

B: Oh, yeah. Come into the office, kid, and I'll show you what we got. OK, here's a GC trace on the off-gas line from about two weeks ago—this peak is CMPH, and it's down around 2.5 where it's supposed to be. It started to creep up on us last week, and here's yesterday's trace—the peak is up to 7, which means we're absorbing a lot less CMPH than we're supposed to. Unless we can fix this, we're going to have to take the process off line and break down the tower to see what's going on, and a lot of people across the street will be very unhappy if we do that. Got any ideas for us, kid?

R: Um . . . I think we once used the diffusion equation and Henry's law—or maybe it was Raoult's law—to analyze a continuous packed absorption tower. I could try doing that.

B: Say what?

R: Of course I can only do it if the column is isothermal. It is, isn't it? If it isn't, I think I'd also have to write a differential energy balance equation, and that's farther than we ever went in that course. I can give it a shot, though—you do have Matlab here, don't you?

On-the-Job Training
Richard Felder, CEE 2008

S: Yes, Reggie—got something for me on that column?

R: I get that you need eight theoretical stages.

S: What?

R: Eight theoretical stages—here's the McCabe-Thiele diagram.

S: Uh . . . how'd you do McCabe-Thiele with nine components in the feed?

R: I just used two components I could look up data for in Perry's Handbook and used Raoult's law to come up with an equilibrium curve and then did McCabe-Thiele.

S: For a multicomponent system with nine highly polar compounds?

R: Well, they never really talked about systems like this in mass transfer—the professor said that equilibrium separations were trivial and we spent most of the

S: Ever size a pump?

R: No—pumps were in the fluids syllabus, but the prof. took so long on the Navier Stokes equation that we never got to them.

S: Know anything about separation process synthesis?

R: Um . . . not really.

S: Heat exchanger networks?

R: No—we only did single exchangers.

S: Using overall heat transfer coefficients and log-mean temperature differences, right?

R: Uh, yes. We were supposed to look at solving more complex problems using a simulator, but the prof. said we needed to learn the fundamentals before getting into black box simulations and I guess we never got past the fundamentals.

S: Equipment cost estimation?

R: My design teammate did that part.

On-the-Job Training
Richard Felder, CEE 2008

S: I see . . . OK, to tell you the truth, Reggie, I'm not sure there's a good fit between your skills and the kind of things we do around here. I'm going to talk to Human Resources about finding you a more suitable position.

R: All right . . . but in the meantime, what should I do while I'm here?

S: Know how to use a coffee maker?

R: Um . . . . ❐

So, what's the problem here?

Some Quotes about Assessments

- Assessment is the senior partner in learning and teaching. Get it wrong, and the rest collapses (Barr and Tang, 2011)

- The reason for an explicit focus on improving assessment practice is the huge impact it has on the quality of learning (Boud and Associates, 2010)

- Perhaps the most important single dimension of assessment is the complexity of intellectual operations required to perform the assessment task (Miller and Parlett, 1974)

Some Quotes about Assessments & Feedback

- Being a good teacher is very much about being a good designer of tasks (Knight, 2002)

- Changing feedback is at the heart of pedagogy – it is never marginal (Boud, 2000)

- Assessment is the teachers' main lever to change the way students study and get them to put effort into the right things (Graham Gibbs)

Data from a Personal Survey of Faculty Members

	Activities
1	Module Planning
2	Getting Presentations ready
3	Preparations just before classes
4	Classroom Teaching (lectures)
5	Conducting tutorials
6	Setting Assessment Tasks (Assignments, Projects, Exams)
7	Personal interaction with students
8	Interactions with students via electronic media
9	Marking (Assignments, reports and exams)
10	Final Grading

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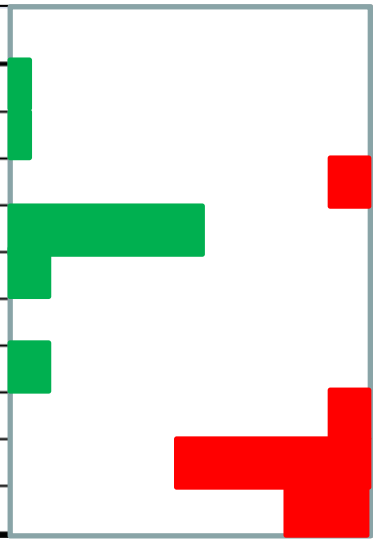
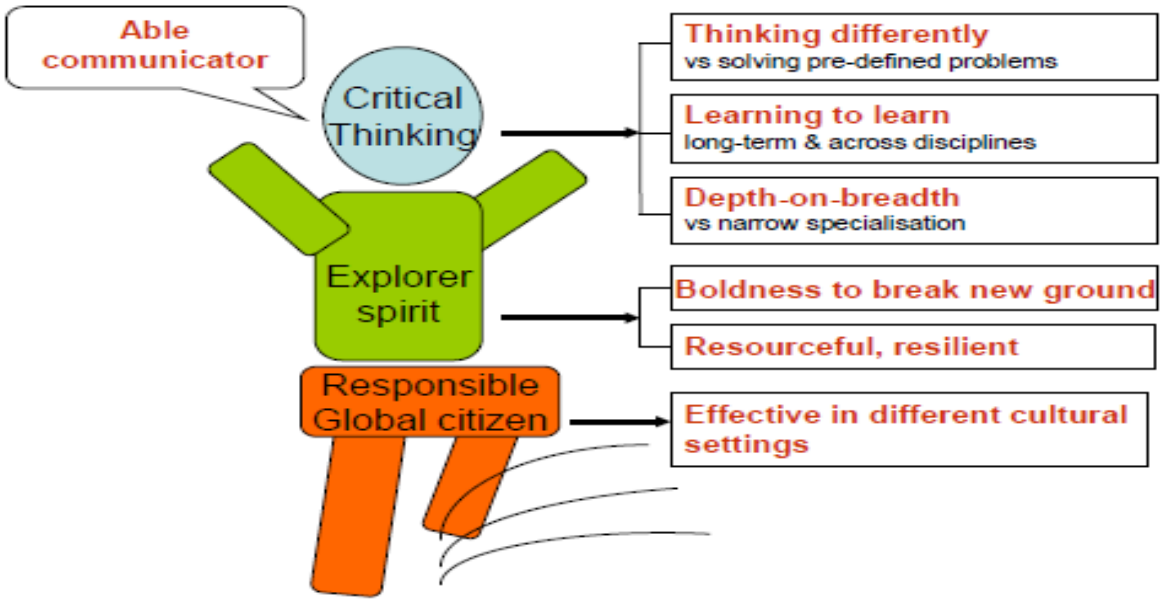


NUS Vision on Education:

Tsinghua Global Vision Lecture delivered by NUS President Prof Tan Chorh Chuan, 2009



"A lifetime of careers"
and not
"a career for life"

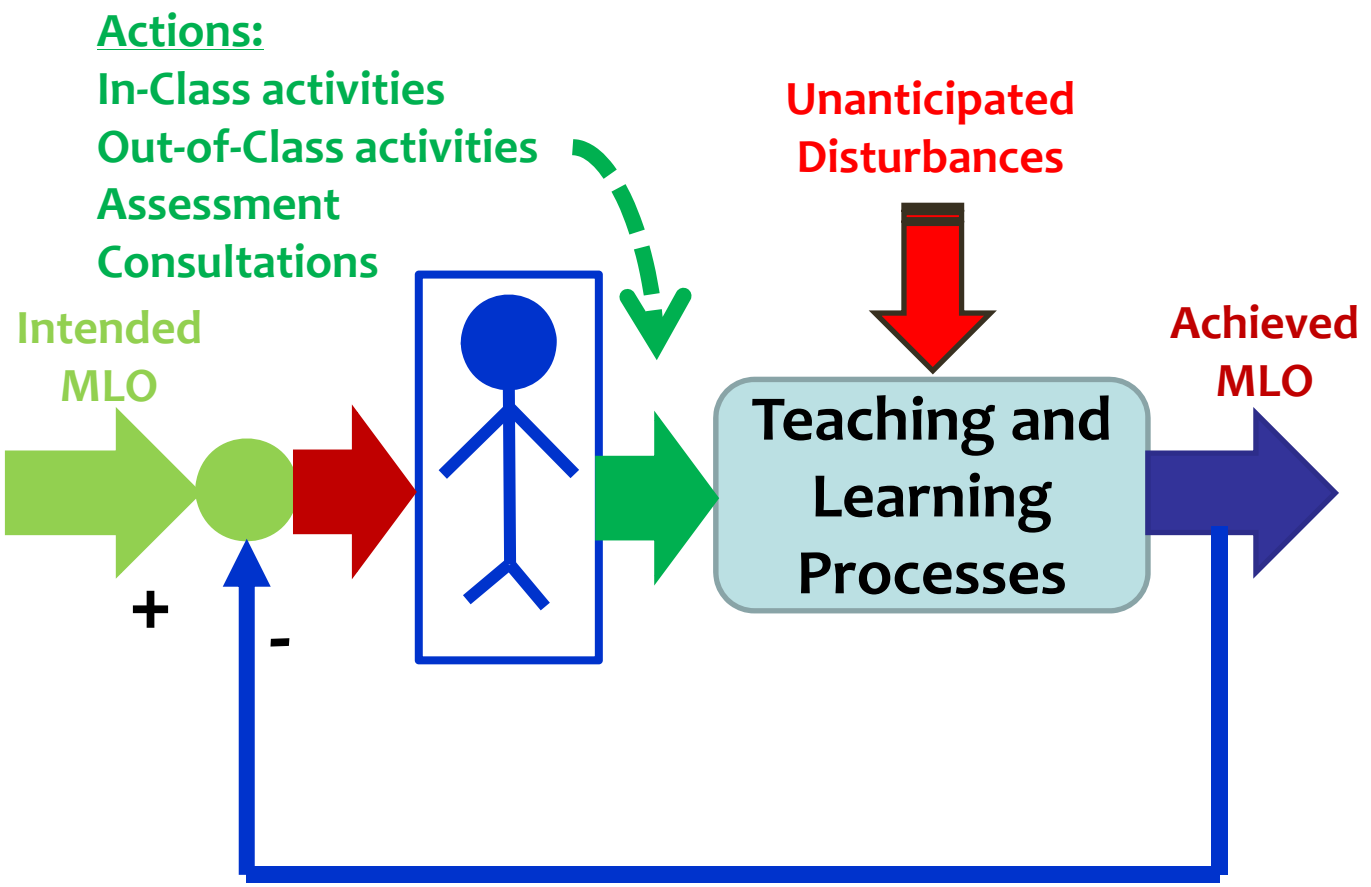
Thinking What we Teach and How we Teach

International Benchmarking

Explosion of Information
Commoditization of Content

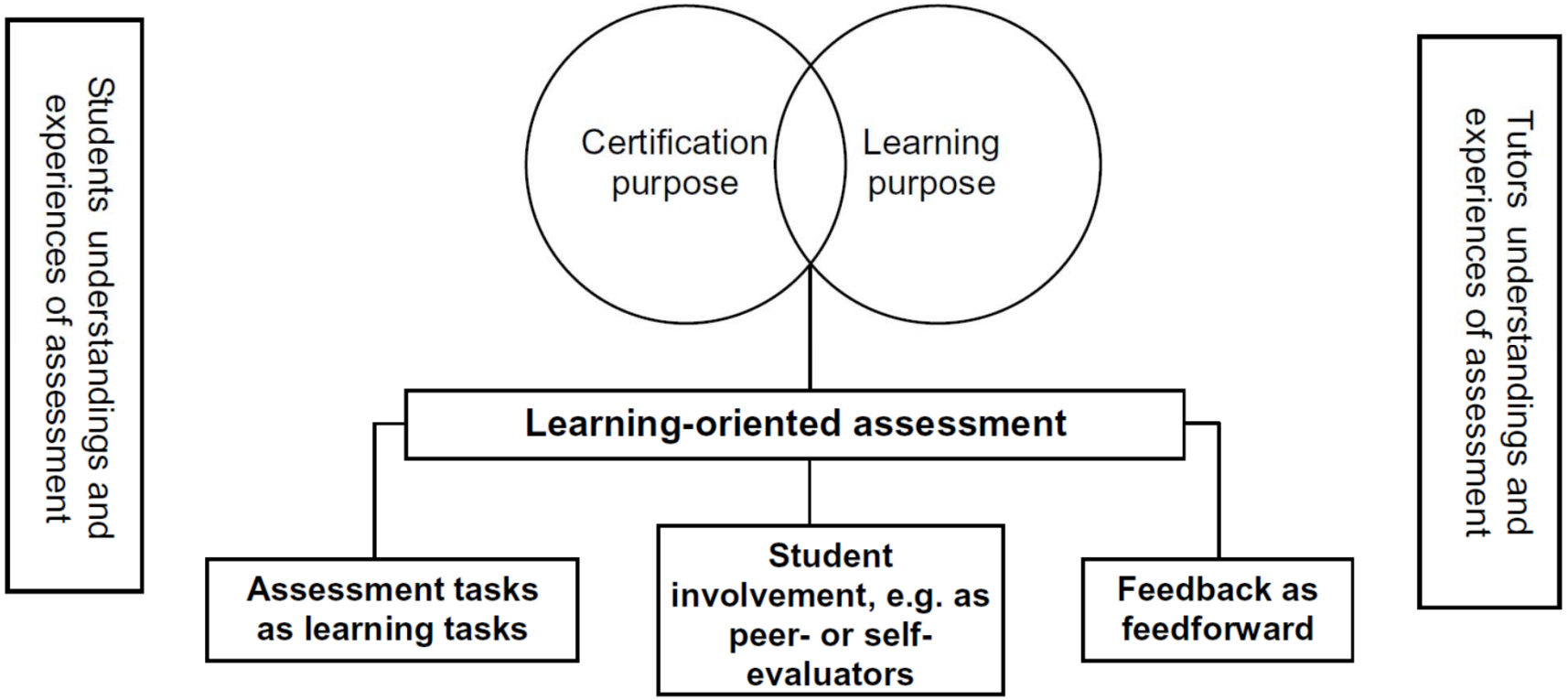
Research-like
Teamwork
Presentation & Critique
Blended/Flipped
Experiential

Emphasize on Threshold Concepts
Spend more time on "Difficult"/"wicked" issues
Creative and Critical Thinking Exercises
Applications → Ill-defined problems, reasoning, troubleshooting



Systems Theory: Optimal Action = f(Past, Present, Future)

Learning-Oriented Assessment: Carless, 2007

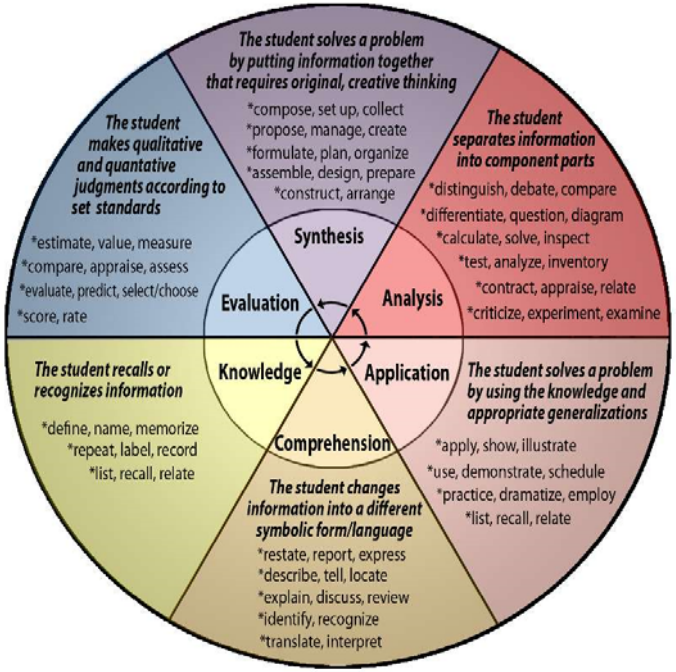


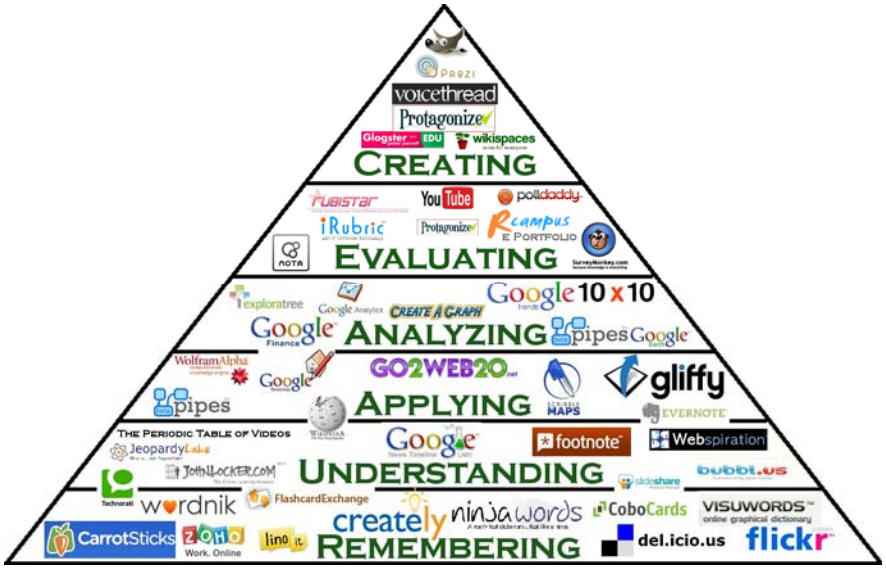
7 Safe Predictions on the Future of Assessments

1. Will emphasize teamwork as much as individual work
2. Students will have choices (to choose from)
3. Will heavily make use of augmented reality
4. Will test subject as well as digital competencies
5. Will develop skills in synthesis and decision making
6. Will demand students to exhibit an array of complex skills on open ended problems
7. Will engage students in “knowledge production” and completely away from “knowledge echoing”

The "Learning Outcomes" Based View

- Learning Outcomes – must efficiently scan the spectrum of skills, abilities and attitudes





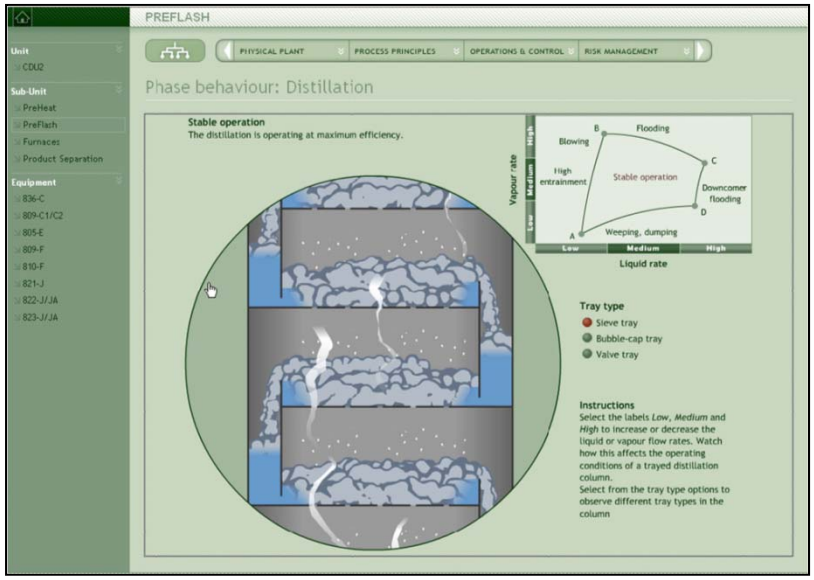
The Temporal View of Assessment

- Optimal Assessment = f (Past, Present, Future). As with everything, the right mix is key!!
- However, if focus tends to be too much on the Present (the current module), that's not the best way to prepare our students → must avoid compartmentalized and surface learning
- Assessments must integrate the past learning experience of the students and also involve manageable extrapolations (think critically and creatively about new situations, scenarios) and transferability

Institutional Emphasis: Part of Faculty Professional Development

- A 3-hour session on Assessment and Feedback is a mandatory part of our PDP-T Programme. (~4 times each year)
- A 2-hour session on Grading and Feedback is also provided to Teaching Assistants (~4-6 times each year)
- Sessions on Assessment Design (and *sometimes* on Feedback) are offered as part of Continuous Professional Development Programme (from external speakers as well)
- Use of Technology emphasized for A&F → IVLE features for online assessment, feedback through Gradebook etc.
- **Teaching Enhancement Grants** provided each year to enhance A&F

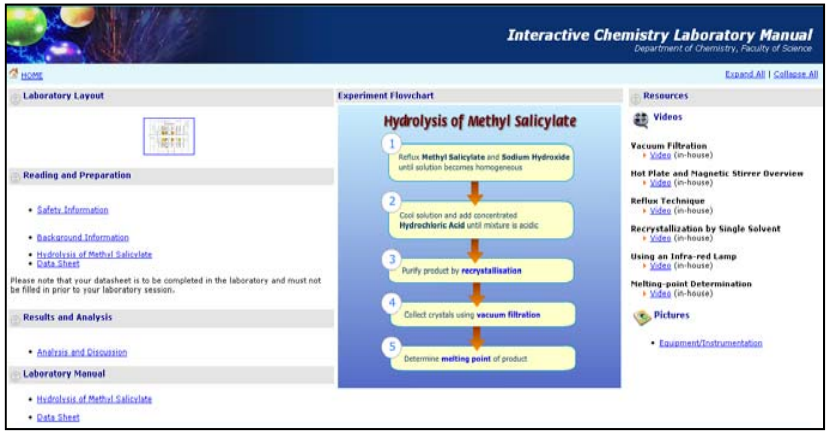
Context Rich, Authentic, Immersion - Practice and Feedback



Context Rich, Authentic, Immersion - Practice and Feedback

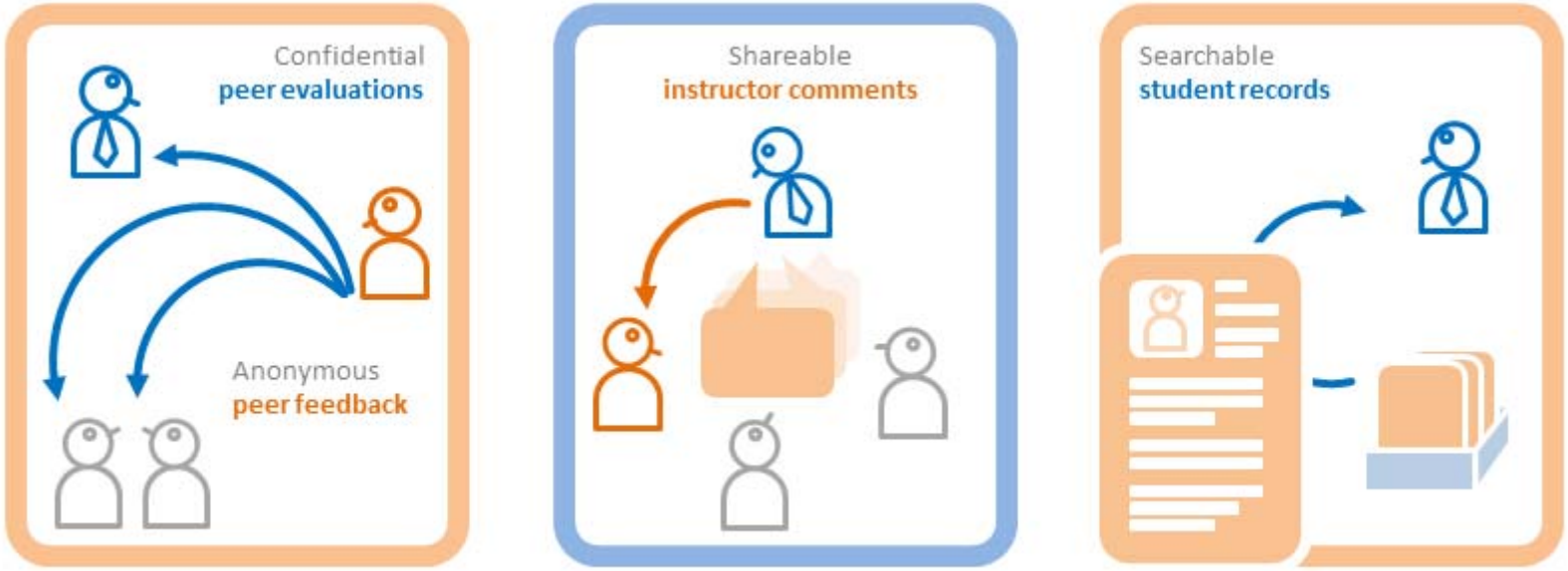
Inquiry Labs

Down with the recipe; towards construction and practicing "discovery" → in-silico or wet labs

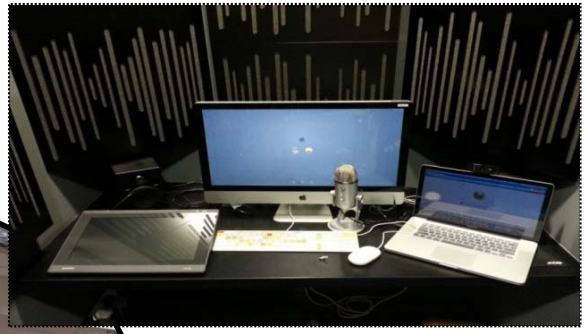


TEAMMATES: Peer Involvement

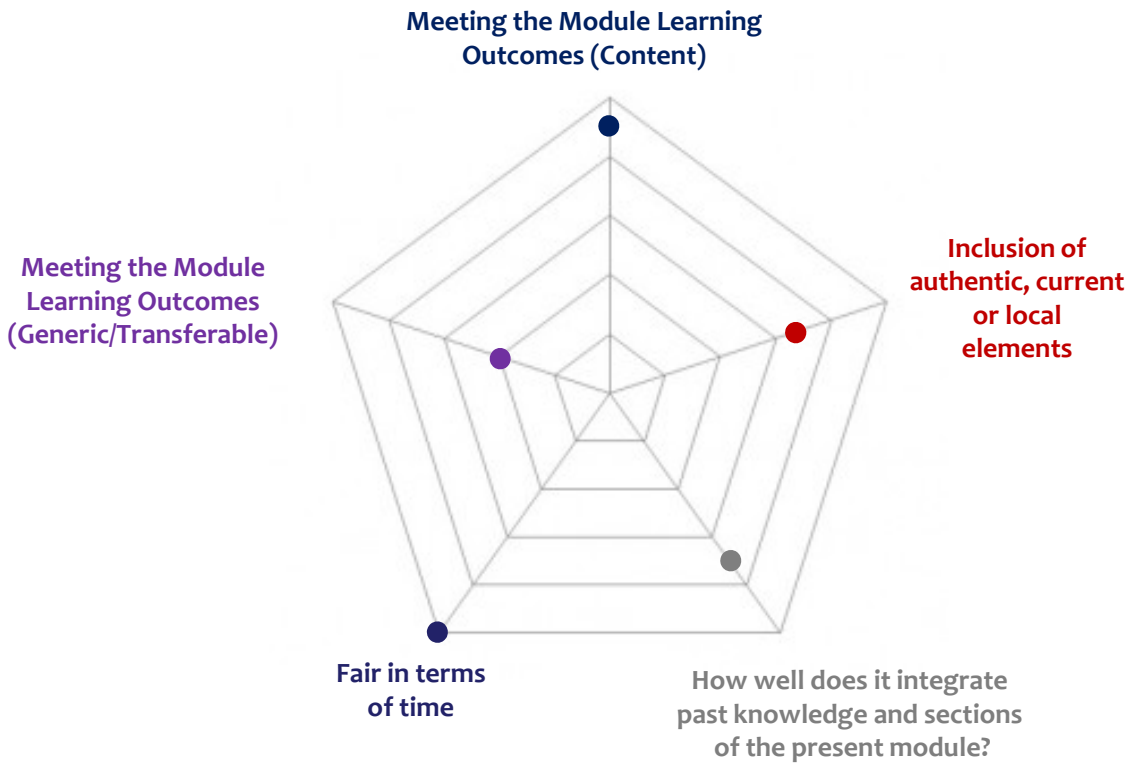
https://youtube.googleapis.com/v/mDtfmNmRwBM&hd=1&autoplay=1&rel=0



Learning Spaces



Good Operating Principles



Assessment for whom?

Assessment as learning
Assessment of learning

What to assess?

- Key concepts
- Threshold Concepts
- Learning outcomes of module
- Learning outcomes of programme

How to assess?

- Authentic Assessments
- Individual vs. Group
- Use of Technology

Assessment

What to assess?

- Levels of Blooms Taxonomy
- Critical and Creative Thinking
- The Thinking Process
- Teamwork/Collaborative Skills
- Communication

When to assess?

- Frequency (number of assessments)
- Timing (related to the dynamics of learning)

Who will assess?

- Self-Assessment
- Peers/Peers assessing Peers
- Instructor
- Colleagues / External Party

Strengthening the Feedback Channel Critical an possible more than ever before

Hallmark of Quality Assessments

- **A**uthentic elements
- **B**alance between content of the module and generic skills
- **C**omprehensive coverage of the syllabus (content) and learning outcomes
- **D**esigned for the future years (pre-req module)
- **E**xtrapolative components – assessment *as/for* learning and not only *of* learning

Hallmark of Quality Assessments

- **F**air – length, twists, …
- **G**enerate alternative solutions or perspectives – rather than a single one
- **H**ave antidotes to the pathologies of learning – Inertia, Amnesia, Fantasia and Nostalgia
- **I**ntegrate concepts within the module and the past learning. Not let students leave with a silo impression
- **J**ump threshold concepts

Your Questions & Comments are Welcome