CWSEI end-of-year, April 11 2014

A Hands-on Workshop on Evaluating Teaching Enhancement Projects

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Workshop objectives

You will move towards a practical evaluation plan by …

- Using a framework to bring focus to your project evaluation.
- Articulating **questions**, **indicators** and **techniques** that address the focus (foci) of your project evaluations.
- Begin next steps –
  i.e. consider timelines, challenges, opportunities & milestones.

Outline

1. Introduction – why / what
2. Your projects & evaluation focus areas (with an example)
3. Worksheet 1: "*focus, questions & indicators*"
   - Solo + share then facilitated sharing with all participants.
4. Evaluation techniques or methods (six types)
5. Worksheet 2: "*Techniques, opportunities & challenges*"
6. Considerations and next steps
   - Worksheet 3: opportunities, timelines, milestones, considerations
   - Importance of (a) focus, (b) audience, (c) variety of data & techniques
   - Likelihood of iteration

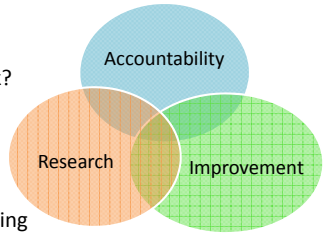
We will transcribe / copy all work and return to everyone.

1. Why should we care?

- All innovation or research is *iterative*.
- *Iterative* implies feedback … implies data for decision making.
- When to worry about evaluation?
  - As part of project design and management ….
  - Difference between fishing versus targeted effort.

Purposes of evaluation

- Part of a project design & management framework.
- Accountability.
  - What worked?
  - Were project objectives met?
  - Demonstrated 'success' leads to further success.
- Improvement.
  - How can we improve?
  - Why did efforts work or not work?
- Research.
  - What is new about it?
  - What is worth disseminating?



Basically "articulating" the mental checking that is probably going on all the time as you work on a project.

Audience – the stake holders:

- Formative (supports improvement)
  - Self – formative evaluation – improvement
- Summative (accountability & dissemination)
  - Funding sources
  - Institutional interests
  - Dissemination (maybe a different level rigor)
  - Peers – colleagues – contributors
  - Students? Maybe, especially to show changes due to student input.

The "stories" or evidence may be similar for these

Context: frameworks for a whole project

- Projects need planning → managing → evaluating.
- One framework is Kellogg Foundation's Logic Model.
- Faculty Arts has useful derivative models.
- We will focus on evaluation, but constructs can be traced back to prior steps in these models.

Evaluation framework (i.e. workshop outline)

1. Step 1: focus on project goals
   - What questions will evaluation answer?
   - What are indicators of progress?
2. Step 2: identify evaluation **techniques** for questions & indicators.
3. Step 3: consider opportunities, timelines, milestones, challenges.

Step 1. What are your "focus areas"?

- Facilitated discussion of
  - Your project goals
  - Focus areas (and "indicators" or "data")
- Take a moment;
  - jot down one or two project goals

  … How vague? … How precise?

(Iteration will be expected !)

Example

- Improve learning
  - Improve learning in tutorials
    - Improve learning in tutorials by training TAs
      - Improve learning in tutorials by increasing interactions between learners and TAs

Potential Questions and Indicators

- Do students do better in tutorials, as indicated by
  - performance on tutorial problems
- Are tutorials more interactive, as indicated by
  - Number of interactions in tutorial
  - Students' perception of interaction
- Do students find tutorials more helpful, as indicated by
  - students' perceptions
  - Attendance

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3. Evaluation Planning Worksheet 1 of 3

- On your own …
- Share at your table
- Share with whole group (facilitated)

Evaluation Planning Worksheet (1 of 3)

Focus Areas	Questions	Indicators
Think "who is the audience"		

Techniques, challenges, and milestones

Focus Area:	Question	Indicator	Technique	Opportunities	Challenges
improve learning in tutorials … by training TAs	Are tutorials more interactive following TA training?	No. of interactions in tutorial Quality of interactions			
	Do students find tutorials more helpful?	Attendance Perceptions towards tutorials and/or interactivity			

4. Evaluation techniques

A. Interviews
B. Observations
C. Surveys
D. Diagnostics
E. Data mining
F. Experiments

A. Interviews (direct or indirect)

- Semi-structured interviews with students can contribute to in-depth understanding of students' thinking habits and learning.
- Give more detailed understanding, but only for a small subset of the students.

- Examples:
  - Interviewing students who work with PhET simulations facilitated the design of the constraints and affordances of the simulations.
    Wieman, C. E., Adams, W. K., Perkins, K. K. (2008). [1]
  - Interviewing six students helped to identify factors that affect positive and negative attitudinal shifts in Chemistry.
    Berg, C. A. R. (2005). [2]

B. Observations (indirect)

- Observing behaviours of students and instructors in the classroom can give a detailed, quantified, understanding of learning processes in the class.
- These often include observation protocols that are adapted to the specific context.
- Examples:
  - Observing TA behaviours and student engagement in physics labs found that students are more engaged when TAs initiate more interactions.
    Stang, J. B., Roll, I. (2013). [3]
  - The COPUS tool is used to evaluate how interactive a lecture is.
    Smith, M. K., Jones, F. H., Gilbert, S. L., Wieman, C. E. (2013). [4]

C. Surveys (perceptions …)

- An instrument that asks students to report their attitudes, motivations, or strategies.
- Very useful to compare groups of students within section or across sections, courses, and universities.
- A large collection of validated surveys.
- Examples:
  - Increased exposure to scientific writing improves the quality of students' writing.
    - Katharine Semsar, Jennifer K. Knight, Gülnur Birol, Michelle K. Smith, The Colorado Learning Attitudes about Science Survey (CLASS) for Use in Biology, CBE Life Sciences Education,10:268-278. doi:10.1187/cbe.10-103133 2011.
    - Malin Hansen, Gülnur Birol, Longitudinal Study of Student Attitudes in a Biology Program, CBE Life Sciences Education, in press, 2014.

D. Diagnostics (hard / quantitative)

- These are well-crafted and often validated assessments that evaluate knowledge with regard to specific learning goals.
- Given across years and institutions. Students are not being graded.
- Often used in quasi-experiments to compare across sections, years.
- Examples:
  - One section had jigsaw group work; the other did not. Huge effects in favour of jigsaw.
    Doymus, Kemal (2008) [6]
  - How is students' demographic and educational diversity related to their conceptual learning in introductory university physics? Gender matters, language does not, at UBC.
    Antimirova, T., Noack, A., MilnerUBolotin, M. (2009) [7].

E. Data Mining (quantitative / qualitative)

- A retrospective analysis of existing data that allows us to associate different factors in a given course.
- Examples:
  - Correlating incoming attitudes to students' eventual choice of majors was used to evaluate who will become a science major.
    Perkins, K. K., Gratny, M. (2010) [8].

F. Experiments (depends on experiment)

- These are experiments in which students within the same section are randomly assigned to a treatment group. These studies are harder to conduct.
- Examples:
  - Following an exam, students redid sections of the exam in groups. Performance on subsequent assessment improved following the group exam.
    Gilley, B. H., Clarkston, B. (2014). [9].

Balance in the evidence being gathered

- Evidence vs. perceptions
- Quantitative vs. qualitative
- Research, evaluation, and/or accountability
- Consider how you would answer this question as if it came from each relevant stake holder:

  "how do we know your project was a success?"

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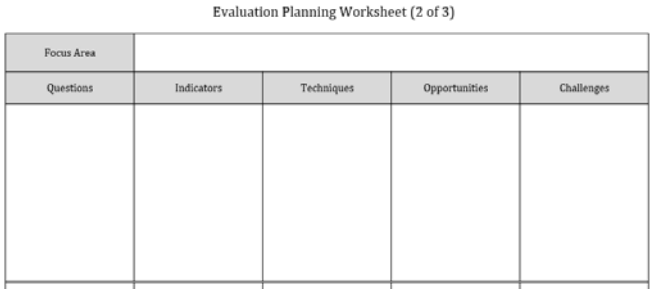
5. Worksheet 2 of 3; techniques

- Align techniques, opportunities & challenges with indicators.
- Solo, share at table, share with all (facilitated)


Evaluation Planning Worksheet (2 of 3)

Focus Area				
Questions	Indicators	Techniques	Opportunities	Challenges

Techniques, challenges, and milestones

Focus Area:

Question	Indicator	Technique	Opportunities	Challenges
Are tutorials more interactive following TA training?	No. of interactions in tutorial Quality of interactions	Observations Interviews	An existing observation protocol	What control condition? Who will do observ'ns? Will observations affect behaviour? Who to observe? Who to interview? (potential biases)?
Do students find tutorials more helpful?	Attendance Perceptions towards tutorials and/or interactivity	Evaluate attendance in sections with TAs before and after training Survey	Tutorials already use clickers. Could be used to obtain data. Collaboration with instructors teaching other courses with tutorials to compare perceptions and/or expectations	What about other factors that affect attendance, such as day, time, and proximity to finals Incorporate survey into course work to reduce extra student work How to define "helpful"?

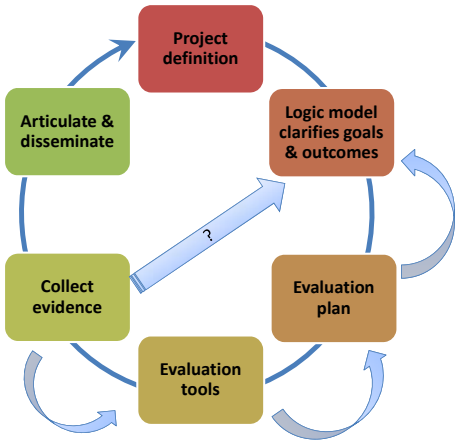
6. Next steps

Use workshop results to:

- Identify timing constraints
- Establish a timeline with milestones
- Remember to consider
  - Focus of the project.
  - Audience for evaluation outcomes.
  - Variety of data & techniques.

- Iterate.
  Planning, execution and evaluation are rarely linear, especially in academic settings.

Evaluation is iterative !



6. Worksheet 3 of 3; details

- Components of a running an evaluation project

Evaluation Planning Worksheet (3 of 3)

Indicator	Instrument	Respondents (e.g. sample population)	Data Analysis Plan	Responsibility (who's in charge of this part)	Timeline

Questions, comments, discussions

- Questions?
- Concerns?
- Priorities?
- Feedback forms …
- Other comments … ?

Thanks to everyone who helped!

References and resources

Interviews

1. *Wieman, C. E., Adams, W. K., Perkins, K. K. (2008). PhET: Simulations that enhance learning. Science, 322(5902), 682U683.*
2. *Berg, C. A. R. (2005). Factors related to observed ajtude change toward learning chemistry among university students. Chem. Educ. Res. Pract., 6(1), 1U18. Chicago*

Observations

3. *Stang, J. B., Roll, I. (2013). Interactions between teaching assistants and students boost engagement in physics labs. arXiv preprint arXiv:1306.6606.*
4. *Smith, M. K., Jones, F. H., Gilbert, S. L., Wieman, C. E. (2013). The Classroom Observation Protocol for Undergraduate STEM (COPUS): A New Instrument to Characterize University STEM Classroom Practices. CBEULife Sciences Education, 12(4), 618U627.*

Surveys

5. *Katharine Semsar, Jennifer K. Knight, Gülnur Birol, Michelle K. Smith, The Colorado Learning Attitudes about Science Survey (CLASS) for Use in Biology, CBE Life Sciences Education,10:268-278. doi:10.1187/cbe.10-103133 2011.*
6. *Malin Hansen, Gülnur Birol, Longitudinal Study of Student Attitudes in a Biology Program, CBE Life Sciences Education, in press, 2014..*

Diagnostics

7. *Doymus, Kemal. Teaching Chemical Equilibrium with the Jigsaw Technique. Research in Science Education 38, no. 2 (2008).*
8. *Antimirova, T., Noack, A., MilnerUBolotin, M. (2009, November). The effect of classroom diversity on conceptual learning in physics. In AIP Conference Proceedings (Vol. 1179, p. 77).*

Data Mining

9. *Perkins, K. K., Gratny, M. (2010, October). Who Becomes a Physics Major? A Long-term Longitudinal Study Examining the Roles of PreUcollege Beliefs about Physics and Learning Physics, Interest, and Academic Achievement. In AIP Conference Proceedings (Vol. 1289, p. 253).*

Experiments

10. *Gilley, B. H., Clarkston, B. (2014). Collaborative Testing: Evidence of Learning in a Controlled In-Class Study of Undergraduate Students. Journal of College Science Teaching, 43(3).*

Other Resources

1. *Kellogg logic model*
2. *Andrea's check list?*
3. *There are of course many, and an online collection is being developed.*