Strategies for Meaningful Interpretation of ATE Evaluation Data

Preconference workshop at the ATE Principal Investigators Conference

October 23, 2013

This material is based upon work supported by the National Science Foundation under Grant No. 1204683. The content reflects the views of the authors and not necessarily those of NSF.
WORKSHOP: Strategies for Meaningful Interpretation of ATE Evaluation Data

10/23/2013

©2013 EvaluATE

www.evalu-ate.org

2
**EvaluATE Mission**

To promote the goals of the ATE program by

- partnering with ATE projects and centers to strengthen the program's evaluation knowledge base
- expanding the use of exemplary evaluation practices
- supporting the continuous improvement of technician education throughout the nation

**EvaluATE Activities**

- 6 webinars per year
- Quarterly newsletter
- Website with evaluator directory and digital resource library
- Annual survey of ATE grantees
- **Annual workshop at ATE PI conference**

©2013 EvaluATE  www.evalu-ate.org
Workshop Materials

**Booklet**

*Most* slides  
Supplemental reading  
Feedback survey

**Complete Slide Deck**

evalu-ate.org/events/workshop_2013/
## Workshop Agenda

<table>
<thead>
<tr>
<th>Time</th>
<th>Session Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00</td>
<td>Welcome and introductions</td>
</tr>
<tr>
<td></td>
<td>Hands-on evaluation</td>
</tr>
<tr>
<td></td>
<td>Evaluation in the big picture</td>
</tr>
<tr>
<td></td>
<td>Asking questions, gathering data, answering questions</td>
</tr>
<tr>
<td>2:15</td>
<td>Break</td>
</tr>
<tr>
<td>2:30</td>
<td>The comparative imperative</td>
</tr>
<tr>
<td></td>
<td>Rubrics</td>
</tr>
<tr>
<td></td>
<td>Recommendations</td>
</tr>
<tr>
<td>3:40</td>
<td>Open question-and-answer</td>
</tr>
<tr>
<td>3:50</td>
<td>Feedback survey</td>
</tr>
<tr>
<td>4:00</td>
<td>Adjourn</td>
</tr>
</tbody>
</table>

---

**My name is ...**

**My role in the ATE program is ...**
It’s a Fan!
It’s a Spear!
It’s a Wall!
It’s a Rope!
It’s a Tree!
It’s research!
It’s our advisory committee’s feedback!
It’s someone else saying if we met our goals!
It’s a survey!
It’s course evaluations!
It’s the NSF annual report!
Paper Towel Evaluation

1. In groups of 2-3 people, evaluate the paper towels.
2. Report
   (a) your conclusions
   (b) how you reached.

Paper Towel Evaluation

Small Group Reports:
a. What are your conclusions?
b. How did you reach these conclusions?
Evaluation: The BIG Picture

Project

Inputs

Process

Outcomes

Resources

Activities, Products

Impact on knowledge, behavior, policies/practices

Human and fiscal assets brought to bear on the project
What the project *does*, *e.g.*,  
- Develop curriculum  
- Provide services  
- Disseminate materials

What *difference* the project makes in the context of advanced technological education, *e.g.*,  
- Improve teaching and learning in advanced technologies  
- Increase the number of skilled technicians entering the workforce  
- Increase the representation of women and minorities in technical fields
Overarching questions about the project’s quality, progress, and impact that the evaluation seeks to answer based on evidence.

Data gathered through systematic means from a variety of sources.
Verifying, cleaning, organizing, transforming, and describing data

Making sense of analyzed data to inform judgments about the project’s quality, progress, and/or impact
Combining findings to make conclusions in relation to the purpose of the evaluation
WORKSHOP: Strategies for Meaningful Interpretation of ATE Evaluation Data

10/23/2013

©2013 www.evalu-ate.org
How does evaluating a consumer product differ from evaluating an educational project?
How does evaluating a consumer product differ from evaluating an educational project?

- Which paper towel is best?
- What is the overall quality of the paper towel?
- How effective is the paper towel for cleaning up typical household spills?
- How durable is the paper towel?
- Is the paper towel worth the cost?
- Which project is best?
- What is the overall quality of the project?
- How effective is the project for improving technological education?
- How durable is the project?
- Is the project worth the cost?

Brand X Paper Towel...
- absorbs X ounces of water
- holds X rolls of pennies before breaking when dry
- holds X roll of pennies before breaking when wet
- costs $.0X per sheet
Project X Towel...
- absorbs X ounces of water
- holds X rolls of pennies before breaking when dry
- holds X roll of pennies before breaking when wet
- costs $.0X per sheet
Project X ...

- [relevant indicators of quality]

- The project’s overall quality is very good.
- The project is highly effective in engaging students in problem-based learning.
- The project is somewhat sustainable.
- The project’s student retention strategies are cost-effective.
How does evaluating a consumer product differ from evaluating an educational project?

Shouldn’t an evaluation focus on whether a project is meeting its goals?
### Strategies for Meaningful Interpretation of ATE Evaluation Data

<table>
<thead>
<tr>
<th>293 ATE awards (NSF database)</th>
<th>29 (10%) randomly selected</th>
<th>24% (7) included goals/objectives</th>
<th>23 goal/objective statements</th>
<th>5 randomly selected</th>
</tr>
</thead>
</table>

- Develop externship-driven curriculum modules in emerging technology
- Identify and apply appropriate frameworks for evaluation
- Implement industry-driven project-based learning modules created by secondary and post-secondary faculty
- Increase the pool of skilled ATE graduates for green/sustainable technology careers
- Create a long-term student engagement model

### Are these ATE goal/objective statements focused on project PROCESS or OUTCOMES?

<table>
<thead>
<tr>
<th>Process Statements</th>
<th>PROCESS - Activities</th>
<th>PROCESS - Products</th>
<th>PROCESS - People reached</th>
<th>OUTCOMES - Changes in - knowledge</th>
<th>OUTCOMES - behavior</th>
<th>OUTCOMES - broader conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop externship-driven curriculum modules in emerging technology</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Identify and apply appropriate frameworks for evaluation</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Implement industry-driven project-based learning modules created by secondary and post-secondary faculty</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Increase the pool of skilled ATE graduates for green/sustainable technology careers</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Create a long-term student engagement model</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
For more on the role of goals in focusing an evaluation, read *Essentials of Utilization-Focused Evaluation*, pp. 205-208 in your workshop booklet.

ATE project evaluation should include, *but not be limited to*, assessing whether goals were met.
How did you translate your paper towel evaluation data into evaluative conclusions?

**Analysis**
- Verifying, cleaning, organizing, transforming, and describing data

**Interpretation**
- Making sense of analyzed data to inform judgments about the project’s quality, progress, and/or impact

**Synthesis**
- Combining findings to make conclusions in relation to the purpose of the evaluation (i.e., answer evaluation questions)
NSF is committed to broadening participation.”
26% of Project X’s students are female

**Interpretation**

- With other paper towel brands
- With user needs
- With past experience
- With expected performance
Interpretation Requires **Comparison**

- national data
- among sites
- project-set targets
- over time
- external criteria

---

**Broadening Participation**

- 26% of Project X’s students are female
- 21% of all ATE students in this discipline are female
- 15% of ATE students *not including Project X’s* in this discipline are female
- 1.8% of technicians in this field in the U.S. workforce are female
26% of RCNET’s students are female

21% of all ATE students in energy production are female

15% of ATE students not including RCNET’s are female

1.8% of power plant operators, distributors, dispatchers are female

Data Sources:

a 2013 ATE Annual Survey
b U.S. Department of Labor

National Data

Bureau of Labor Statistics
Women in the Labor Force: A Databook

National Data

Bureau of Labor Statistics:


Percentage of Female Workers in Select Occupations

- Chemical technicians: 40.3%
- Engineering technicians: 16.3%
- Precision instrument and equipment repairers: 16.2%
- Welding, soldering, & brazing workers: 7.8%
- Computer control programmers & operators: 5.5%
- Machinists: 4.4%
- Aircraft mechanics & service technicians: 3.1%
- Power plant operators, distributors, & dispatchers: 1.8%
- Automotive service technicians & mechanics: 1.4%

Percentage of Underrepresented Minorities in Select Occupations

- **Aircraft mechanics & service technicians**: 7.5% Hispanic or Latino, 14% Black or African American
- **Automotive service technicians & mechanics**: 7.4% Hispanic or Latino, 9.6% Black or African American
- **Chemical technicians**: 6.4% Hispanic or Latino, 15.4% Black or African American
- **Computer control programmers & operators**: 10.8% Hispanic or Latino, 12.3% Black or African American
- **Engineering technicians**: 6.4% Hispanic or Latino, 11.7% Black or African American
- **Machinists**: 4.5% Hispanic or Latino, 13.3% Black or African American
- **Precision instrument & equipment repairers**: 9.1% Hispanic or Latino, 9.6% Black or African American
- **Welding, soldering, & brazing workers**: 8.7% Hispanic or Latino, 17.1% Black or African American

**Source**: Bureau of Labor Statistics, 2012

---

Percentage of Underrepresented Minorities in Select Occupations

- **Aircraft mechanics & service technicians**: 17% Hispanic or Latino
- **Automotive service technicians & mechanics**: 13% Hispanic or Latino
- **Chemical technicians**: 10.8% Hispanic or Latino
- **Computer control programmers & operators**: 12.3% Hispanic or Latino
- **Engineering technicians**: 11.7% Hispanic or Latino
- **Machinists**: 4.5% Hispanic or Latino
- **Precision instrument & equipment repairers**: 9.1% Hispanic or Latino
- **Welding, soldering, & brazing workers**: 8.7% Hispanic or Latino

**Source**: Bureau of Labor Statistics, 2012

---

©2013 EvaluATE - www.evalu-ate.org
Digest of Education Statistics 2011

Data from K-16 institutions
- Enrollments
- Degrees awarded
- Student demographics
- Faculty demographics

nces.ed.gov/programs/digest/

Percentage of Associate’s Degrees Awarded to Women in 2010

<table>
<thead>
<tr>
<th>Field</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological Sciences</td>
<td>67%</td>
</tr>
<tr>
<td>Agricultural Sciences</td>
<td>41%</td>
</tr>
<tr>
<td>Physical Sciences</td>
<td>40%</td>
</tr>
<tr>
<td>Earth, Atmospheric, and Ocean Sciences</td>
<td>34%</td>
</tr>
<tr>
<td>Computer Sciences</td>
<td>24%</td>
</tr>
<tr>
<td>Engineering Technology</td>
<td>14%</td>
</tr>
<tr>
<td>Engineering</td>
<td>13%</td>
</tr>
</tbody>
</table>

Percentage of Associate’s Degrees Awarded to URMs in 2010

<table>
<thead>
<tr>
<th>Field</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological Sciences</td>
<td>32%</td>
</tr>
<tr>
<td>Computer Sciences</td>
<td>29%</td>
</tr>
<tr>
<td>Engineering Technology</td>
<td>27%</td>
</tr>
<tr>
<td>Physical Sciences</td>
<td>25%</td>
</tr>
<tr>
<td>Engineering</td>
<td>23%</td>
</tr>
<tr>
<td>Agri.</td>
<td>11%</td>
</tr>
<tr>
<td>Earth</td>
<td>8%</td>
</tr>
</tbody>
</table>

33% of the U.S. population are URMs


Annual survey of ATE Grantees
2000 - present
WORKSHOP: Strategies for Meaningful Interpretation of ATE Evaluation Data

Percentage of students in ATE-funded programs from underrepresented minority groups

Percentage of ATE students by discipline who are female
Project-set Targets

May or may not be reflected in project goal statements.
Examples:
- Place 20 students per year in internships
- Increase graduation rates of first-generation students from 50% to 75%
- Engage a cadre of at least 20 faculty members from diverse fields in a community of practice to improve online teaching

External Criteria

- Research-based
- Authoritative
- Generally accepted quality standards

Especially useful for assessing quality for process evaluation (implementation, content, products)
Professional Development for Educators

www.learningforward.org

Credentialing Programs

A Checklist for Evaluating Credentialing Testing Programs

by
Gregory J. Cizek
University of North Carolina at Chapel Hill
Amy A. Germuth
EvalWorks, LLC
Lorrie A. Schmid
University of North Carolina at Chapel Hill
June 2011

www.wmich.edu/evalctr/checklists/
Curricula and Programs

Criteria established by accrediting organizations, e.g.,

National Automotive Technicians Education Foundation

[formerly: Accreditation Board for Engineering and Technology]

United States National Security Agency Information assurance Education and Training Program

Over Time

![Graph showing percentage trends over time]

- 2012 Project starts
- Baseline trend
- 35% 34% 37% 50% 65% 73% 82%

©2013 EvaluATE www.evalu-ate.org
Among Sites

Percentage of ATE 101 students who continue on to ATE 102

Interpretation Requires Comparison

- national data among sites
- project-set targets over time
- external criteria
The Next Step

Making Evaluative Conclusions

rubric noun \'rü-brik

a guide listing specific criteria for grading or scoring project performances, papers, projects, or tests
## All-Purpose Holistic Rubric

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Excellent</strong></td>
<td>Clear example of exemplary performance or best practice in this domain; no weaknesses</td>
</tr>
<tr>
<td><strong>Good</strong></td>
<td>Very good or excellent performance on virtually all aspects; strong overall but not exemplary; no weaknesses of any real consequence</td>
</tr>
<tr>
<td><strong>Adequate</strong></td>
<td>Reasonably good performance overall; might have a few slight weaknesses but nothing serious</td>
</tr>
<tr>
<td><strong>Marginal</strong></td>
<td>Fair performance, some serious (but nonfatal) weaknesses on a few aspects</td>
</tr>
<tr>
<td><strong>Poor</strong></td>
<td>Clear evidence of unsatisfactory functioning; serious weaknesses across the board or on crucial aspects</td>
</tr>
</tbody>
</table>

Source: Table 8.2 from *Evaluation Methodology Basics* by Jane Davidson (2005)

## Project-Specific Holistic Rubric

<table>
<thead>
<tr>
<th>Category</th>
<th>Poor</th>
<th>Fair</th>
<th>Good</th>
<th>Excellent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Student Impact</strong></td>
<td>No set plan for how to engage students either through coursework or experiential learning under the auspices of the project</td>
<td>Students engaged at least sporadically in experiential learning activities; there is talk of a certificate or degree program</td>
<td>Students engaged in a systematic way in experiential learning or a degree/certificate program, but may need further development</td>
<td>Clear strategy for engaging students under the auspices of the project through both experiential learning and a degree/certificate program</td>
</tr>
<tr>
<td><strong>Scholarship</strong></td>
<td>No established plan for obtaining external grants or contracts; no evidence of activity in this area</td>
<td>Minimal plans for obtaining external grants or contracts; some proposals submitted</td>
<td>Evidence of some scholarship, but may not be obviously related to project</td>
<td>Successful in obtaining external grants and contracts in focus area</td>
</tr>
<tr>
<td></td>
<td>No evidence of advancing scholarship</td>
<td>Evidence of some scholarship, but may not be obviously related to project</td>
<td>Evidence of some scholarship directly related to the project</td>
<td>Strong record of substantial scholarship directly related to the project</td>
</tr>
<tr>
<td></td>
<td>Not clear how the project contributes to enhancing perceptions of college</td>
<td>Potential to raise the institution’s stature in national rankings or perceptions if successfully implemented</td>
<td>Could bring national attention to college through exceptional performance in its focus area</td>
<td>Likely to attract national attention through its distinctive focus, assets, or innovation</td>
</tr>
<tr>
<td><strong>External Impact</strong></td>
<td>No set plans for external engagement</td>
<td>Some ideas for external engagement, but few have been implemented yet</td>
<td>External engagement, either through service or collaborations, is an important part of the project</td>
<td>Project has a strong external focus that is central to its mission, with demonstrable impacts on the community attributable to the project/institution</td>
</tr>
<tr>
<td><strong>Sustainability</strong></td>
<td>No clear plan for supporting the center by grants, contracts, and/or fees</td>
<td>Some ideas for becoming partially self-sustaining but need to be further developed</td>
<td>Grants or contracts may bring significant external support to the project, but it depends on forces beyond the control of the project; fees or other revenue streams are likely to provide stable income</td>
<td>Very likely that grants, contracts, and/or fees will be a significant and stable source of support for the project</td>
</tr>
</tbody>
</table>

©2013 [EvaluATE](www.evalu-ate.org)
### Project-Specific Holistic Rubric

<table>
<thead>
<tr>
<th>Poor</th>
<th>Fair</th>
<th>Good</th>
<th>Excellent</th>
</tr>
</thead>
<tbody>
<tr>
<td>No set plan for how to engage students either through coursework or experiential learning under the auspices of the project</td>
<td>Students engaged at least sporadically in experiential learning activities; there is talk of a certificate or degree program</td>
<td>Students engaged in a systematic way in experiential learning or a degree/certificate program, but may need further development</td>
<td>Clear strategy for engaging students under the auspices of the project through both experiential learning and a degree/certificate program</td>
</tr>
</tbody>
</table>

#### Project-Specific Holistic Rubric

<table>
<thead>
<tr>
<th>Project</th>
<th>Student Impact</th>
<th>Scholarship</th>
<th>External Impact</th>
<th>Sustainability</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROJECT A</td>
<td>Poor</td>
<td>Fair</td>
<td>Good</td>
<td>Excellent</td>
</tr>
<tr>
<td>PROJECT B</td>
<td>Poor</td>
<td>Fair</td>
<td>Good</td>
<td>Excellent</td>
</tr>
<tr>
<td>PROJECT C</td>
<td>Poor</td>
<td>Fair</td>
<td>Good</td>
<td>Excellent</td>
</tr>
<tr>
<td>PROJECT D</td>
<td>Poor</td>
<td>Fair</td>
<td>Good</td>
<td>Excellent</td>
</tr>
</tbody>
</table>
### Quantitative Weight-and-Sum Rubric

**How effective is the mentoring program for improving student retention?**

<table>
<thead>
<tr>
<th>% of students who self-report that mentoring positively influenced their decision to continue in their programs</th>
<th>Not at all effective (1)</th>
<th>Minimally Effective (2)</th>
<th>Moderately Effective (3)</th>
<th>Very Effective (4)</th>
<th>Data</th>
<th>Score</th>
<th>Weight</th>
<th>Weighted Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤9%</td>
<td>10-29%</td>
<td>30-49%</td>
<td>≥50%</td>
<td>55%</td>
<td>4</td>
<td>.3</td>
<td>1.2</td>
<td></td>
</tr>
</tbody>
</table>

| Retention rate of mentoring participants compared with matched group | Lower or less than 10% higher | 11-20% higher | 21-29% higher | ≥30% higher | 22% | 3 | .7 | 2.1 |
|---|---|---|---|---|---|---|---|

Sum = 3.3 on a scale of 1-4

**Moderately Effective**
How effective is the mentoring program for improving student retention?
- 55% of students said mentoring positively influenced their decision to continue in their program
- Retention rate of course participants is 22% better than that of a matched group

Is that good?
Mentoring was moderately effective in improving student retention, according to the criteria established for the project. *

* Criteria and specific results also provided to justify conclusion.

**EvaluATE’s Evaluation**

<table>
<thead>
<tr>
<th>Category</th>
<th>Reach</th>
<th>Reaction</th>
<th>Learning</th>
<th>Behavior</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very Good</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fair</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Evaluative Terms/Performance Levels

- **Poor** – Fair – Good – Excellent
- **Not at all effective** – Minimally effective – Moderately effectively – Very Effective
- **Below target** – On target – Above target
- **Needs improvement** – Developing – Proficient
- **Unsatisfactory** – Satisfactory
- **Below expectations** – Meets expectations – Exceeds expectations

![Small group work](image)
Evaluation Data Interpretation in YOUR Context

- national data
- among sites
- project-set targets
- over time
- external criteria

What points of comparison are you using?
What holds promise?
What is especially challenging?

Types of Recommendations

**FORMATIVE**
Suggestions about actions to take to improve performance

**MINOR**
Tweaks to implementation

**MAJOR**
Significant changes in goals, activities, or audiences

**SUMMATIVE**
Suggestions about program expansion/contraction, continuation, cancellation

Changes that substantially impact funding, personnel, policy or service delivery

Proposed actions for project improvement based on evidence
Recommendation Generation Framework

**Evaluation Question: How effective ....?**

- **Highly effective**
  - Report results and lessons learned
- **Moderately effective**
  - Determine facilitators/impediments
- **Minimally effective**
  - Identify weak links
- **Not at all effective**
  - Report results and lessons learned

**If summative recommendations are appropriate,**
- **Recommend discontinuation**
- **Recommend strategies for overcoming weaknesses**
- **Recommend low- or no-cost actions that will maximize facilitators/minimize impediments**

**If summative recommendations are appropriate,**
- **Recommend continuation, expansion**

---

**Want to Know More about Evaluation Recommendations?**

Visit [Translating Evaluation Findings into Action](http://www.wmich.edu/evalctr/2010/06/lori-wingate-ph-d/)

---

©2013 EvaluATE
For more on interpretation, conclusions, and recommendations in evaluation, read *Essentials of Utilization-Focused Evaluation*, pp. 349-365 in your workshop booklet.

Questions?
Thank you!

EvaluATE
Evaluation Resource Center for advanced technological education