Making It Better: Using Research Results and NSF Frameworks to Improve the Quality and Usability of Evaluations

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Evaluation Basics: Soup, Cooks, Guests & Improvement

When cooks taste the soup, it's *formative evaluation;* the collection of information that can be used to improve the soup. If necessary, the cook's next step is to explore strategies to fix the problem. The cook makes some changes and then re-tastes the soup, collecting more formative evaluation data.

When the guests taste the soup at the table, they're doing *summative evaluation.* They are collecting information to make a judgment about the overall quality and value of soup. Once the soup is on the table and in the guests' mouths, there is little that can be done to improve that soup.

Thanks to Bob Stake for first introducing this metaphor.

Evaluation Basics: Four Steps to Improving Projects and Programs

- **Collect the Data**
- **Analyze the Data**
- **Take Action on the Results**
- **Provide Feedback**

Challenging Assumptions

When I was a physicist people would often come and ask me to check their numbers, which were almost always right. They never came and asked me to check their assumptions, which were almost never right.

Eli Goldratt

Pat's Evaluation Assumptions

- The core evaluation question is "What works for whom in what context?"
- "Black hole" evaluations are bad.
- If you aren't going to use the data, don't ask for it.
- A bad measure of the right thing is better than a good measure of the wrong thing.
- Acknowledging WIIFM increases response rates.
- Process is a tool to help understand outcomes.
- Outcomes are at the core of accountability.

Federal STEM Education Goals and Metrics

K-12 Student Achievement

Significant improvement in achievement using rigorous evaluation designs.

% meeting or exceeding proficient and advanced levels on state measures.

Significant contribution to understanding of learning

Using multi site controlled trials.

Effective approaches adopted at scale.

K-12 Student Engagement

Increased enjoyment of subject.

Compared to non-participants:

- more math and science courses taken.
- more STEM college majors.
- greater participation in sustained extracurricular activities.

NSF Frameworks

- Framework for Evaluating Impacts of Informal Science Education Projects

http://informalscience.org/evaluations/eval_framework.pdf

- Framework for Evaluating Impacts of Broadening Participation Projects

http://www.nsf.gov/od/broadeningparticipation/framework-evaluating-impacts-broadening-participation-projects_1101.pdf

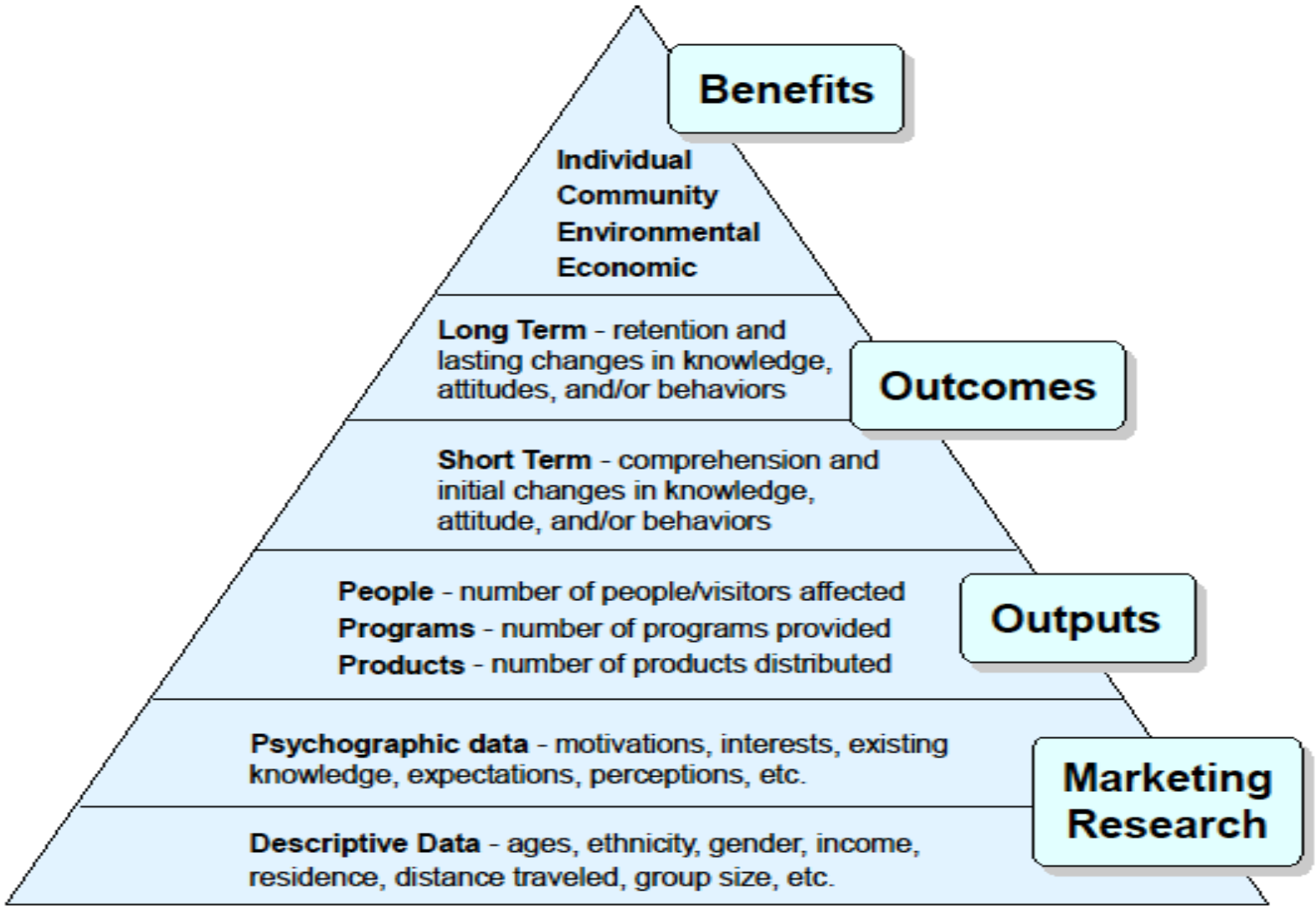
Broadening Participation Outcome

To increase the number and diversity of members from underrepresented groups in each of the following five areas:

- having access to the benefits of science, technology, engineering, and mathematics (STEM) knowledge,
- having access to STEM knowledge,
- studying STEM,
- working in STEM areas,
- generating STEM knowledge.

Informal Science Education Impacts

- Awareness, knowledge or understanding of STEM concepts, processes or careers.
- Engagement or interest in STEM concepts, processes, or careers.
- Attitude towards STEM-related topics or capabilities.
- Behavior resulting from experience.
- Skills based on experience.
- Other (describe).


Benefits
Individual
Community
Environmental
Economic
Long Term - retention and lasting changes in knowledge, attitudes, and/or behaviors
Outcomes
Short Term - comprehension and initial changes in knowledge, attitude, and/or behaviors
People - number of people/visitors affected
Programs - number of programs provided
Products - number of products distributed
Outputs
Psychographic data - motivations, interests, existing knowledge, expectations, perceptions, etc.
Descriptive Data - ages, ethnicity, gender, income, residence, distance traveled, group size, etc.
Marketing Research

ISE Category of Impact	Indicators?	Evidence?
Awareness, knowledge or understanding of STEM concepts, processes or careers		
Engagement or interest in STEM concepts, processes, or careers		
Attitude towards STEM-related topics or capabilities		
Behavior resulting from experience		
Skills based on experience		
Other (describe)		

The Right Design for the Question

Study Type	Design	Advantages	Disadvantages
Quantitative Case Study	One-shot Post-test only Design	Takes fewer resources Can present a "snapshot" of a point in time	Doesn't look at change
Quasi-experimental Study	One-shot Pre-test- Post-test Design	Looks at change over time	Other things besides treatment could be causing change
Quasi-experimental Study	Post-test Only Intact Group Design	Compares to another group	Doesn't control for any initial differences in groups

The Right Design for the Question

Study Type	Design	Advantages	Disadvantages
Ethnography	Participant observer examination of group behaviors and patterns	Explores complex effects over time	Resource intensive Story telling approach may limit audience Potential observer bias
Case Study	Exploration of a case (or multiple cases) over time	Provides an in-depth view Elaborates on quantitative data	Limited generalizability
Mixed Methods Study	Use of more than one of the above designs	Can counteract disadvantages of any one design	None

Some Tips for Getting More Accurate Data For Evaluations With Diverse Populations

Ask demographic information ONLY at the end of measures.

Have participants should define their own race/ethnicity and disability status .

Prior to collecting data from students, review the space to make sure that the décor does not reflect dominant group stereotypes and check to see that it is comfortable and inviting to your target groups including being accessible to people with disabilities.

Don’t say a test is a measure is of student ability and don’t mention any gender or race differences that there might be in results of a test or a survey.

Make the rating procedures as anonymous as possible.

Have more than one rater rate the responses and check for inter-rater reliability.

ISE Evaluation Issues

Maturation

Real vs. Ideal

Informal Science Education vs. Formal Science Education

Cultural Competency

Sustainability

Some Web-based Resources

- Framework for Evaluating Impacts of Informal Science Education Projects

http://informalscience.org/evaluations/eval_framework.pdf

- Framework for Evaluating Impacts of Broadening Participation Projects

http://www.nsf.gov/od/broadeningparticipation/framework-evaluating-impacts-broadening-participation-projects_1101.pdf

- Assessment Tools in Informal Science

http://www.pearweb.org/atis

- OERL, the Online Evaluation Resource Library.

http://oerl.sri.com/home.html

- User Friendly Guide to Program Evaluation

http://www.westat.com/pdf/projects/2010ufhb.pdf

- Collecting, Analyzing and Displaying Data

http://www.nsfagep.org/files/2011/09/CollectingAnalyzingDisplayingData.pdf