Introduction to the User’s Guide for Evaluating Learning Outcomes from Citizen Science

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DEVISE

- Assessed the state of evaluation in citizen science
- Determined common goals, objectives, and indicators across projects
- Inventoried existing instruments; developed/modified new and existing evaluation tools
- Provide professional development opportunities
- Build community of practice for evaluations of citizen science projects

DEVISE instruments can be found at: CitizenScience.org/Evaluation
USER’S GUIDE FOR EVALUATING LEARNING OUTCOMES FROM CITIZEN SCIENCE

- Professional Development, as part of DEVISE
- Multidisciplinary
- Practical overview of evaluation techniques, tips, and best-practices
- Templates and worksheets to help with planning and implementation

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FRAMEWORK FOR EVALUATING CITIZEN SCIENCE LEARNING OUTCOMES

Behavior change resulting from participation such as place-based and global stewardship, new participation, and community or civic action.

Interest in pursuing science and environmental topics, careers, activities, and issues.

Procedural skills such as asking questions; designing studies; collecting, analyzing and interpreting data; experimenting; argumentation; synthesis; technology use; communication; and critical thinking.

The extent to which a learner has confidence in his or her ability to participate in science or to successfully perform stewardship behaviors.

Knowledge of the nature of science; understanding of the scientific process and how science is conducted by researchers.

Motivation to pursue science and environmental goals such as STEM careers and citizen-science project activities.
Who is it for?

• The guide is designed to be used by citizen science practitioners who want to evaluate outcomes from their citizen science projects

• Since it has been released, we have seen it downloaded by people in a wide variety of roles throughout the field of citizen science
Primary role in citizen science
n=601

- Other: 11%
- Evaluator: 10%
- Citizen Science Researcher: 9%
- Project Assistant: 3%
- Educator/Outreach Specialist: 26%
- Project Leader/Coordinator: 26%
- Scientist/Analyst: 7%
- Participant/Volunteer: 4%
- I am not involved in citizen science: 4%

* n = number of downloads as of 11/4/14
Who uses it?

- Zoos and Aquariums
- Monitoring Programs
- Science Museums
- Colleges and Universities
- Consulting Firms
- Conservation Organizations
- Educational Organizations
- Public Schools
- Government Agencies
- Wildlife Societies
- Citizen Science Projects
- Environmental Service Groups
- Non-profit Organizations
- Individuals
How is it used?

- **Start-to-Finish**: plan, implement, and share evaluation

- **Supplementary**: utilize sections and resources to augment or build up an evaluation plan already in development

- **Fine-Tune**: use templates and resources provided to ensure that an existing evaluation plan is properly constructed and executed
PLAN: INVENTORY

Gives guidance on documenting information relevant to the project:

- Background and context
- Goals
- Targeted outcomes
- Develop logic model
Users together with stakeholders will:

- Determine what will be evaluated
- Identify key questions
- Determine indicators for each outcome
- Lay out timeline, budget, and limitations
PLAN: DESIGN

Guides users in designing a data collection strategy that identifies procedures that are:

- Feasible
- Cost-effective
- Viable

Determine best method for project needs with overview of strengths/weaknesses of evaluation designs.
PLAN
INVENTORY
DEFINE
DESIGN

IMPLEMENT
DEVELOP
TEST
ADMINISTER

SHARE
ANALYZE
REPORT
DISSEMINATE
IMPLEMENT: DEVELOP

- Collect credible data that will increase the evaluation’s accuracy and utility
- Choose the right instrument
- Use this section with Appendices F and G
IMPLEMENT: FIELD TEST

• Field test instruments and refine as needed based on test results
  - Suitability
  - Utility
  - Clarity

• Create a data management plan
IMPLEMENT: ADMINISTER

• Recruit participants for evaluation:
  - Determine best medium for collecting data
  - Communicate purpose and risks/benefits to participants
  - IRB

• Administer final instruments and collect data
SHARE: ANALYZE

Includes a sample codebook, gives an overview of the standard practices for analyzing each of the following types of data:

- Quantitative
- Qualitative
- Mixed Methods

### TYPES of DATA

<table>
<thead>
<tr>
<th>TYPES of DATA</th>
<th>POSSIBLE TYPE OF ANALYSIS</th>
</tr>
</thead>
</table>
| Categorical Data (also called Nominal Data) | Frequency (count of categories)  
Mode (the most common item)                                 |
| Ordinal Data             | Frequency (count of values)  
Mode (the most common item)  
Median (middle ranked item)  
Percentiles                     |
| Interval Data            | Frequency (count of values)  
Mode (the most common item)  
Median (middle ranked item)  
Percentiles  
Addition, subtraction  
Mean, standard deviation, standard error                    |
| Continuous or Ratio Data | Frequency (count of values)  
Mode (the most common item)  
Median (middle ranked item)  
Percentiles  
Addition, subtraction  
Mean, standard deviation, standard error  
Ratio, or coefficient of variation |
Overview of evaluation report components:
SHARE: DISSEMINATE & INFORM

Includes strategies for:

- Sharing findings with stakeholders
- Publishing
- Additional ways to disseminate work
- Using evaluation to inform program
Appendices and Resources

- Nearly half of the guide is made up of useful appendices and resources, including templates, worksheets, and sample evaluation planning.
APPENDIX C: PARTICIPANT CONSENT FORM TEMPLATE

You are invited to participate in a research study regarding [brief project description] and conducted through [institution and partners]. Please read this form carefully and ask any questions you may have before agreeing to be in the study. You will be given a copy of this form to keep for your records.

Purpose: The purpose of this study is [describe the nature and purpose of the study in a few sentences].

Procedures: If you agree to be in this study, you will be asked to [explanation of what the participant is being asked to do] regarding [state the topic]. This should take approximately [approximate time commitment].

Risks and Benefits: We do not anticipate any specific risks resulting from this study (or acknowledge unpredictable risks if appropriate). The study will not have any direct benefits for you, [or describe any benefits or incentives] but your participation will help us learn more about [describe any potential benefits for the researcher].

Voluntary Nature of Participation: Your decision whether or not to participate will not affect your current or future relations with [institution administering the study]. If you decide to participate, you are free to withdraw at any time without affecting those relationships. You may decline to answer any questions that you do not feel comfortable answering.

Confidentiality: This research will not include any information that will make it possible to identify you. All data collected from [describe data collection procedure, i.e., survey, interview, etc.] will be kept in a locked file. Only the researcher will have access to this file. This consent form will be stored in a locked file separately from the data and will be destroyed at the end of this study.

Contacts and Questions: The researcher conducting this study is [researcher name]. If you have questions later, you may contact him/her at [researcher contact information].

If you have any questions or concerns regarding your rights as a subject in this study, you may contact the [institution IRB name] at [contact information for Internal Review Board].

Statement of Consent: I have been given information about this research study and its risks and benefits and have had the opportunity to ask questions and have them answered to my satisfaction. I consent to participate in this study.

Signature ______________________ Date __________

APPENDIX D: COMPARISON OF DATA COLLECTION METHODS

<table>
<thead>
<tr>
<th>METHOD</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>Survey</td>
<td>Provide a structured questionnaire to the participant. The researcher asks the participant a series of questions and obtains responses. This method is useful for obtaining data on attitudes, beliefs, and behaviors.</td>
</tr>
<tr>
<td>Focus Groups</td>
<td>Conduct face-to-face meetings with a small group of people to gather their insights and perspectives on a particular topic. The researcher facilitates a discussion, encourages open and honest communication, and collects data through active listening.</td>
</tr>
<tr>
<td>Observations</td>
<td>Observe and record the participant’s behavior in their natural environment. The researcher observes the participant in a structured or unstructured setting and collects data based on what is observed.</td>
</tr>
<tr>
<td>Content Analysis</td>
<td>Analyze and interpret ideas or themes expressed in documents, images, or other media. The researcher identifies patterns, themes, and trends in the data.</td>
</tr>
<tr>
<td>Case Study</td>
<td>Conduct an in-depth investigation of a single participant or a small group of participants. The researcher examines the participant’s behavior, experiences, and circumstances in detail.</td>
</tr>
<tr>
<td>Web Analytics</td>
<td>Collect and analyze data from websites and digital platforms to understand user behavior, preferences, and engagement. The researcher uses software tools to track and interpret data.</td>
</tr>
</tbody>
</table>

STRENGTHS

- Provides a structured framework for gathering data
- Easy to administer and collect data
- Can be used to gather data on a large sample size

WEAKNESSES

- Limited in the types of information that can be collected
- Requires a high level of participation from the respondent
- May not capture all relevant aspects of the participant's experience

Other advantages and disadvantages may apply. This table provides a general comparison of data collection methods, and the choice of method(s) should be based on the specific research questions and study goals.
## APPENDIX E: DATA COLLECTION STRATEGY

<table>
<thead>
<tr>
<th>TIMELINE, PERSONNEL</th>
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<tbody>
<tr>
<td>STUDY DESIGN</td>
<td></td>
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<tr>
<td>INDICATORS</td>
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<tr>
<td>EVALUATION QUESTIONS</td>
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<tr>
<td>INTENDED OUTCOME</td>
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</tbody>
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## APPENDIX F: CHECKLIST FOR DEVELOPING SURVEYS

Adapted from Project STAR (http://www.projectstar.org/star/instrument_DEV/)

Name/Group Number: ____________________________

Circle: First Draft  Second Draft  Final Survey

1. Instrument Title
   - Clear and concise words that reflect the survey's content are used.
   - Program name/type of program is stated, if appropriate.
   - Type of instrument (survey) is indicated.

2. Introductory Statement/Directions
   - Survey's purpose is stated.
   - Information about how the data will be used is included.
   - Level of confidentiality is stated.
   - General directions on how to complete the survey are stated (e.g., when, where, and how to return the survey).
   - Amount of time needed to complete the survey is stated.
   - Specific directions for completing each section of the survey are stated as needed.
   - Respondent is thanked for completing the survey.

3. Demographics (if applicable)
   - Questions that ask respondent for relevant information about him/herself and his/her background are included (e.g., name, grade, age, teacher's name, organization/agency, gender, ethnicity).
   - Length of respondents' participation in the program is asked, if appropriate.
   - Date of survey completion is noted.

4. Questions
   - Language that respondents understand is used (i.e., avoid jargon).
   - Questions are not “double-barreled” (e.g., “Has your child's interest in school and homework habits improved?”).
APPENDIX G: BASIC DEMOGRAPHIC QUESTIONS

We would like to know a little more about you so that we can be sure we have reached a broad mix of people. Please answer these few questions about yourself.

1. In what year were you born? __________________

2. Are you a: **MALE** or **FEMALE**? (please circle one)

3. Which of the following groups do you MOST identify with?
   - African-American, Black
   - American Indian, Native American, or Alaskan Native
   - Asian, Asian-American
   - Caribbean Islander
   - Latino or Hispanic
   - Middle Eastern or Arab
   - Native Hawaiian or Other Pacific Islander
   - White, Caucasian, European American
   - Multi-racial (please specify)
   - Decline to answer

4. What is the highest level of education you have completed? (check one)
   - Preschool/Kindergarten
   - Elementary/Primary School
   - Middle/Junior High School
   - High/Secondary School
   - Some College (less than four years)
   - College Degree (Bachelor)
   - Post-Graduate Degree (Master/PhD)

5. What is your combined annual household income? (Choose one response below.)
   - Less than $30,000
   - $30,000 - $49,999
   - $50,000 - $69,999
   - $70,000 - $89,999
   - $90,000 - or more
   - Prefer not to respond

APPENDIX H: EVALUATION PLAN WORKSHEET

**PHASE 1: PLANNING-INVENTORY**

A. Describe the project to be evaluated and its audience.

B. Articulate the goals and intended outcomes of the project.

C. Describe the program logic model in terms of inputs-activities-outputs-outcomes-impacts. (See Appendix B for Logic Model Template)
   - Inputs:
   - Activities:
   - Outputs:
APPENDIX I: GLOSSARY OF TERMS

Activity - Tasks described in a logical model that use inputs (resources) and directly relate to outputs and outcomes.

Bias - Systematic errors that can negatively influence research results such as measurement or sampling-related errors.

Coding - A procedure to transform raw data into a form that can facilitate data analysis; used often to categorize text-based, qualitative data into common themes, concepts, or phrases.

Construct - A psychological attribute or latent variable that cannot be measured directly, such as happiness or interest, but only through a set of measurable indicator variables.

Convenience sample - A sample acquired based on who is available or where they are located.

Data management plan - A document that outlines the processes for collecting, storing, and analyzing data.

Descriptive statistics - Methods used to describe basic features of a particular set of data including the mean, median, mode, range, and standard deviation.

Evaluation - The systematic collection of information to determine strengths and weaknesses of programs, projects, and products so as to improve their overall effectiveness.

Executive summary - A very brief overview and description of a longer report, such as a final report. The executive summary typically describes the program structure, purpose, and results.

Formative evaluation - A type of evaluation that occurs during project development and provides direction for improving implementation and operation. Findings may result in changes to project structure and/or implementation (also called process or implementation evaluation).

Front-end evaluation - A type of evaluation that occurs during the defining phase of a project to obtain baseline information about an audience. Findings help to inform project goals and objectives that can be aligned with audience needs/interests (also called needs or feasibility assessment).

Generalizability - The extent to which research results from a sample can be applied to the larger population, sometimes referred to as ecological validity.

Goals - Broad and abstract statements describing a desired result, e.g., "appreciation for science" or "increase interest in technology."

Impacts - Long-term outcomes that are broad in scope, aimed at expanding knowledge and capacity for a particular field of study, and meant to provide benefits to society.

Indicators - Specific criteria for measuring success. Indicators should articulate how you will define and measure success in reaching your outcomes.

Individual learning outcomes (ILOs) - Measurable changes to project participants, including "cognitive outcomes" (what people know), "affective outcomes" (how people feel), and "behavioral outcomes" (what people do).

Inferential statistics - Methods of analysis that allow researchers to make inferences and test hypotheses about relationships in a sample that are likely to occur in a population.

Informed consent - A procedure for obtaining permission for voluntary participation in a research study, usually by way of a signed form that clearly describes the study and its risks and benefits.

Inputs - Resources dedicated to or consumed by a project; typically things like funding agencies, scientists, staff, volunteers, and technology infrastructure.

Institutional Review Board (IRB) - A committee charged with protecting the rights and welfare of people involved in research. Associated with biomedical services, but behavioral and survey research also fall under the category of research involving human subjects.

Instruments - In evaluation research, a tool used to collect and organize information either through self-reports or observation. Examples include survey questionnaires, behavioral rating scales, tests, checklists and inventories, psychometric instruments, and rating scales.

Impact - Long-term outcomes that are broad in scope, aimed at expanding knowledge and capacity for a particular field of study, and meant to provide benefits to society.

ORGANIZATIONAL TERMS

APPENDIX K: ADDITIONAL RESOURCES FOR USE IN PLANNING AND CONDUCTING PROJECT EVALUATION

CHECKLISTS, GLOSSARIES, TIPS, AND WORKSHEETS

Evaluation Design Checklists (Western Michigan University)
Study Design and Data Collection Worksheet (CAISE, see page 3)
Research and Evaluation Glossary (Colorado State University)
Quick Tips for Evaluation (University of Wisconsin Cooperative Extension)

CULTURALLY RESPONSIVE EVALUATION

Navigating the Complexity of Research on Human Subjects in Informal Settings (Informalscience.org)
Tips for Culturally Sensitive Evaluation (University of Wisconsin Cooperative Extension)

DATA ANALYSIS AND INTERPRETATION

Analyzing Qualitative Data (University of Wisconsin Cooperative Extension)
Using Excel for Analyzing Survey Data (University of Wisconsin Cooperative Extension)
Analyzing Retrospective Pro Data (University of Wisconsin Cooperative Extension)
Understanding Statistics Tutorial (Education Commission of the States)

DATA COLLECTION AND METHODS

Data Collection Overview (NOAA "Designing Education Projects" 2nd ed. 2009, see page 57)
Methods for Collecting Information Tip Sheet (University of Wisconsin Cooperative Extension)
Guide to Sampling (University of Wisconsin Cooperative Extension)

ETHICS

American Evaluation Association Guiding Principles for Evaluators (AEA)
Ethics In Research (Research Methods Knowledge Base)
Does Evaluation Require IRB? (Oregon State University)

EVALUATION REPORTING

Writing an Evaluation Report (University of Illinois at Chicago)
Quality Criteria for Reports (Online Evaluation Resource Library)
Evaluation Report Template (South Australian Community Health Research Unit)

GENERAL EVALUATION GUIDANCE

The PI Guide to Managing Evaluation (CAISE)
The 2010 User-Friendly Handbook for Project Evaluation (NSF)
Planning a Program Evaluation (University of Wisconsin Cooperative Extension)
The **User’s Guide for Evaluating Learning Outcomes from Citizen Science** is available for download here:

CitizenScience.org/Evaluation

Evaluation instruments currently available:

- Interest in Science and Nature
- Nature Relatedness Scale
- Self-Efficacy for Science
- Self-Efficacy for Environmental Action
- Motivation for Science
- Motivation for Environmental Action