

THE CITIZEN SCIENCE APPRAISAL TOOL (CSAT)

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WHAT IS THE CSAT?

WHAT IS THE CSAT? The CSAT was developed to evaluate the quality of citizen science and other participatory approaches. Utilising a lifecycle approach, the CSAT evaluates a project or study starting with the aims through to outcomes and future impacts. The tool considers **citizen science standards, participation, data quality and dissemination**, which are elements of good quality citizen science.

WHO IS THE CSAT FOR?

The CSAT has been designed for both academic and non-academic audiences, and can be used by individuals, groups and organisations employing a citizen science or participatory approach.

HOW DOES IT WORK?

Evaluate the following three levels of engagement: *contributory, collaboration and co-production*^[1,2], across: 1) Science and Research; 2) Leadership and Participation; 3) Data and delivery; and 4) Outcomes, evaluation and open data.

WHEN DO I USE THE CSAT?

The CSAT can a) guide a project or study during its development stage, and b) provide evaluation during implementation and after completion.



HOW DO I USE THE CSAT?

A total of 16 questions are presented, scoring points based on the ability to meet the answer: Yes = 2 ; Unclear = 1 ; No = 0

1. Each question should be answered and scored, with details provided.
2. After answering each question, the scores should be added together to produce a final score.
3. Using the low to high categories at the bottom of the tool, the final score will indicate the quality of a study or project.

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*? = Unclear

| Section | Question | Yes | No | ?* |
|--------------------------------------|---|-----|----|----|
| A. Science & Research | 1) Is there a clear statement of the aims, objectives or goals of the study? 2) Is it clear that the study used a citizen science approach? | | | |
| B. Leadership & Participation | 3) Is the degree of active engagement or participation of citizens identified clearly by the study? 4) Are the roles, responsibilities and type of partnership between citizens, scientists and stakeholders identified and transparent? | | | |
| C. Delivery & Data | 5) Is the extent to which citizen scientists are actively engaged or collaborate in data collection, analysis, and use/dissemination clear? 6) Are citizen science data limitations or biases considered by the study? | | | |
| D. Outcome, evaluation and open data | 7) Are the main findings of the study clearly described? 8) Are the study's outcomes a direct result from the data-driven strategies and solutions generated by the citizen scientists? | | | |

| Section | Question | Yes | No | ? |
|--------------------------------------|---|-----|----|---|
| D. Outcome, evaluation and open data | 9) Do the outcomes of the study have 'real world' decision making implications or impact? | | | |
| | 10) Does the study report intention to track and/or tracking of long-term impacts, changes or 'ripple effects' of the study? | | | |
| | 11) Does the study report any evaluation of citizen knowledge, attitudes, actual and/or intended behaviours? | | | |
| | 12) Does the publication report any accessible dissemination plans or intentional mechanism for sharing the study and its outcomes with citizens? | | | |
| | 13) Are citizens invited to review or participate in the study's publication process? | | | |
| | 14) Are the study's results and outcomes published in an open access format and/or shared in a publicly accessible format? | | | |
| | 15) Are citizen scientists acknowledged in the study's results and publications? | | | |
| | 16) Does the publication provide any critical evaluation of the study, methods and/or examination of its limitations? | | | |

Scores will be categorised using the following scale system, adapted from Wijewardhana et al. [14] Checklist:



CSAT QUESTION GUIDANCE

QUESTION 2

ECSA Principle 4 - Citizens can engage in multiple stages of the scientific/research process, which can include developing the research question or focus, designing the methods, data collection and analysis and communicating the outcomes. Active engagement of citizen scientists in multiple stages of scientific/research process is preferred.

Citizens actively participate as contributors, collaborators, or co-leaders to have a meaningful role in the study's scientific endeavour to generate new knowledge. Citizens may be involved in refining the study processes, materials and protocols. The main characteristics are; (1) citizens are actively involved in research, partnership or collaboration with scientists or professionals; and (2) there is a genuine outcome, such as new scientific knowledge or policy change” [3-5]

QUESTION 3

ECSA Principle 4 - Citizens can engage in multiple stages of the scientific/research process, which can include developing the research question or focus, designing the methods, data collection and analysis and communicating the outcomes. Active engagement of citizen scientists in multiple stages of scientific/research process is preferred.

Q) Has the study clearly identified its approach in terms of contributory (for the people), collaborative (with the people), or co-production (by the people)? [1,3,6]

QUESTION 4

The roles and expectations should be made transparent and citizens should be aware of their contribution to the research. Depending on the context of the study, it may be appropriate for citizens, scientists and stakeholders to have an equal partnership in the research. Q) Is the shift from participant to an active researcher made clear to citizens involved and has the study addressed this? [6]

QUESTION 5

ECSA Principle 4 - Citizens can engage and participate in multiple stages of the scientific/research process, which can include developing the research question or focus, designing the methods, data collection and analysis and communicating the outcomes.

Q) Have citizens been engaged through a co-production or collaborative approach in the data collection, analysis and dissemination? During these processes, is there a clear partnership between citizen scientists with scientists and/or practitioners? [1,3,6,7]

QUESTION 6

ECSA Principle 6 – Citizen science data can contain bias or error, influence by factors such as variability among participants in relation to ability, commitment and effort. Accounting for this error and bias can mitigate this and can be addressed through well-developed protocols, appropriate and good design of activities or tasks that meet the study purpose, and good participant support. Multiple types of data and knowledge generation can be present in citizen science meaning studies should seek appropriate disciplinary standard which can include data quality and quality assurance standards, and peer-review of publications or any materials. [3,6,8]

CSAT QUESTION GUIDANCE

QUESTION 8

A co-creation (by the people) approach has been used and citizen scientists have been active collaborators throughout the study, which has ensured the relevance of the scientific endeavour and developed realistic outcomes or solutions. Q) Have citizen scientists been fully engaged and empowered “not only as data collectors, but also as active collaborators” [7] in producing the strategies and outcomes of the study? [1, 3,6,7,9]

QUESTION 9

ECSA Principle 2 – Alongside answering a research question, outcomes such as informing actions, management decisions or policy are presented. Q) Can the results be applied to the local population? Can the results be directly taken into real-world decision making? Is there a clear pathway to outcome and impact? [3,5,10]

QUESTION 10

Q) Rather than decision making implications, has the study reported any long-term tracking of what has occurred after the study? This may include; (1) Impact of the study on citizen scientists that has led to ripple effects for these individuals or their community; (2) Sustainability of citizen science processes through ripple effects that have led to a continuation of community-engaged citizen science activities; (3) If outcomes or changes produced by the study have led to long-term changes or impacts for citizens; (4) The study reports a foundational partnership or longitudinal relationship with citizens with the intention to return and/or track impacts, changes or ripple effects. [1,7,11-13]

QUESTION 11

ECSA Principle 3 – Both scientists and citizens benefit from taking part, such as learning opportunities, personal enjoyment etc. Evaluating participant knowledge can demonstrate if training and/or the project has been successful (in both content and skill) and can ensure sustained quality through participant understanding and engagement of tasks being completed correctly. Evaluating behaviour changes or intended behaviours may demonstrate intention to continue with CS activities. [3,7]

QUESTION 12

ECSA Principle 5 – Clear communication or dissemination of the study and its outcomes are provided to citizens. This may include how their data are being used, what the research, policy or societal outcomes are, or given the opportunity to ‘see’ their own data and its contribution (in suitable text and graphical forms). [3,5,6]

QUESTION 13

Inviting citizens to participate or review the publication process will further strengthen the co-production and transparency of CS processes and dissemination. Q) Have studies reported any involvement of citizens in the publication process.

CSAT QUESTION GUIDANCE

QUESTION 14

ECSA Principle 7 – Data from citizen science projects are publicly available and if possible, published in open access format.^[3]

QUESTION 15

ECSA Principle 8 – Citizens are acknowledged in project outcomes and publications.^[3]

QUESTION 16

ECSA Principle 9 – Q) Is the study evaluated in any way for its scientific output, data quality, participant experience, wider societal impact, or policy impact? This may be to highlight trustworthiness, transparency or evaluation i.e. does the study report the citizen scientists evaluating the methods they have used and providing feedback?^[3]

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