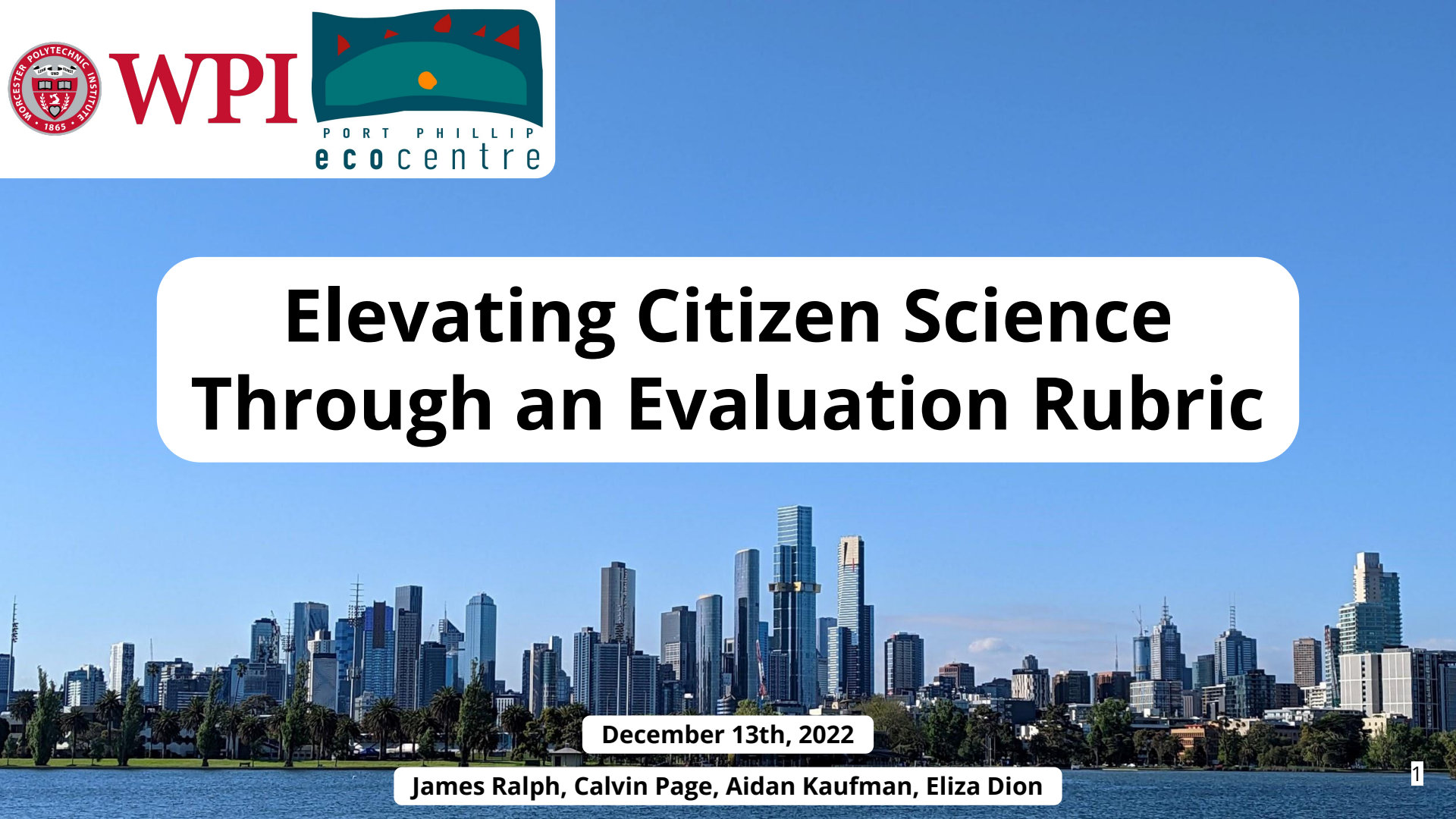
Elevating Citizen Science Through an Evaluation Rubric



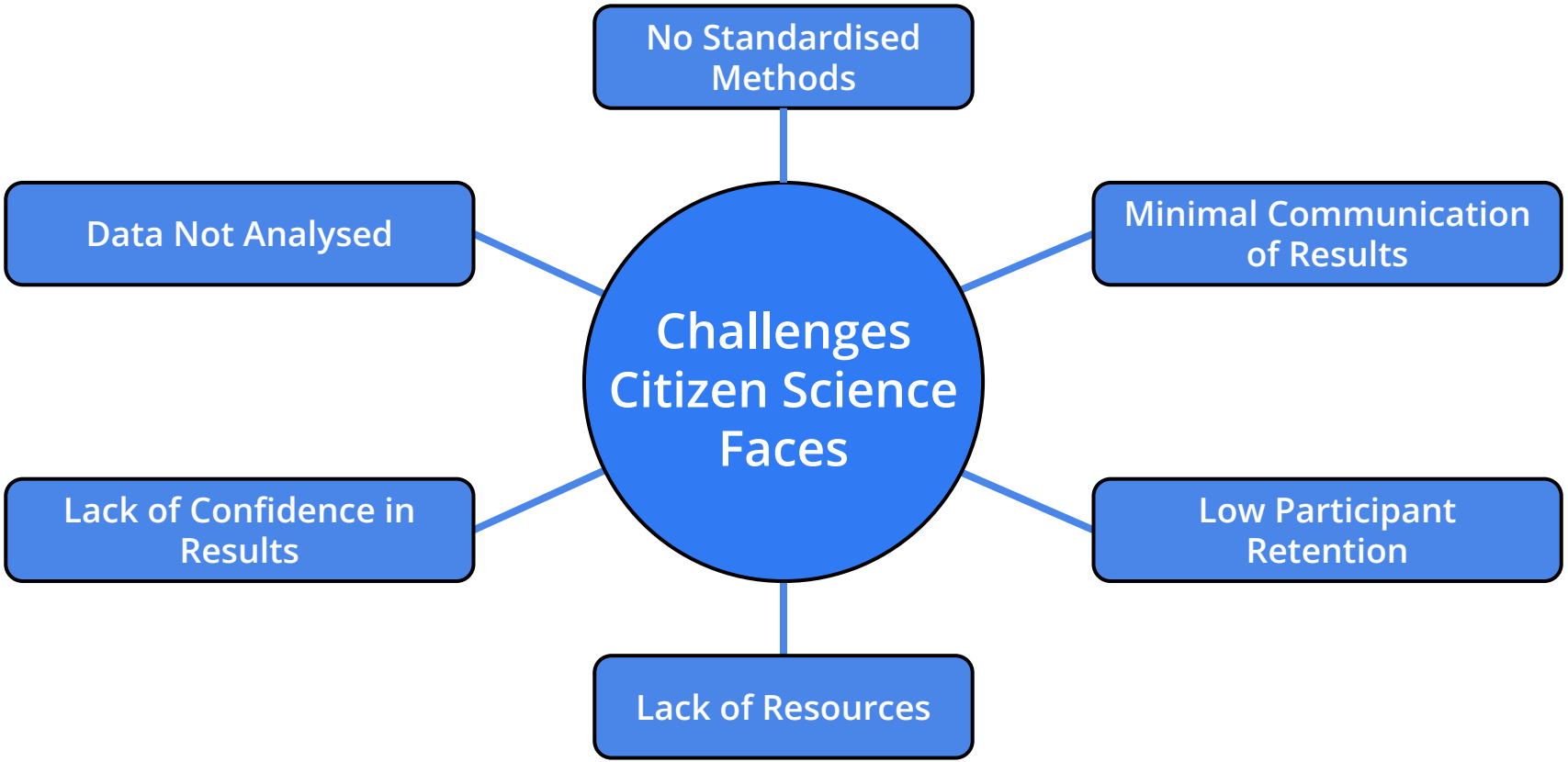
December 13th, 2022

James Ralph, Calvin Page, Aidan Kaufman, Eliza Dion

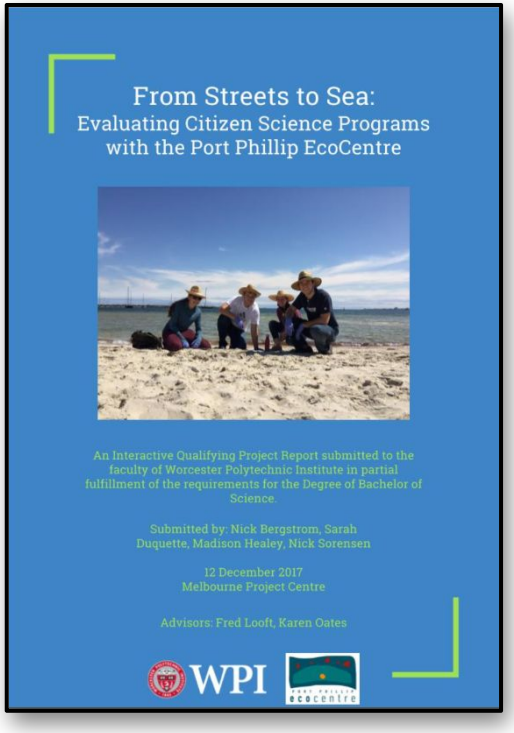
Citizen science fills data gaps, engages communities, and impacts policy

Courtesy of EPA NSW

Citizen science faces challenges that limit its potential

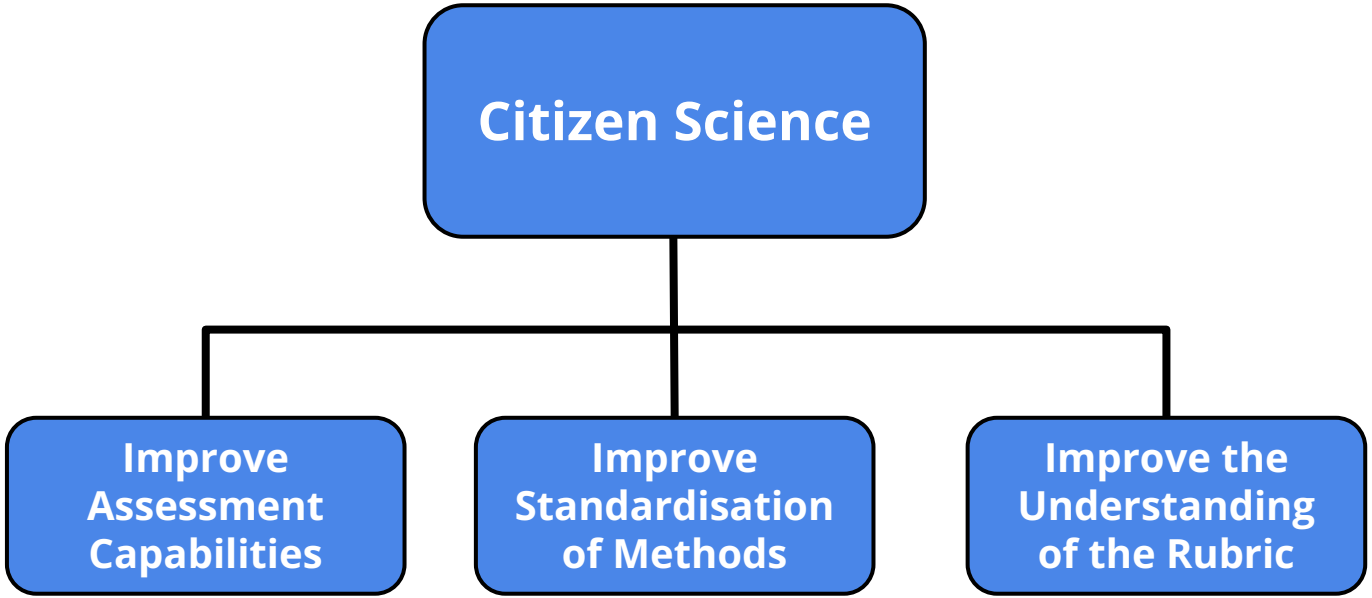


Citizen Science Evaluation Rubric



EcoCentre Rubric Elements and Subelements	
Elements	**Subelements**
Scientific Contribution	Project Objective
	Project Quality
	Data Analysis
	Project Robustness
Volunteer Recruitment/Retention	Volunteer Sourcing
	Volunteer Motivation
	Time/Effort Investment
	Returns
Communication	Content
	Project Story
	Comms Delivery

Our opportunity to elevate citizen science



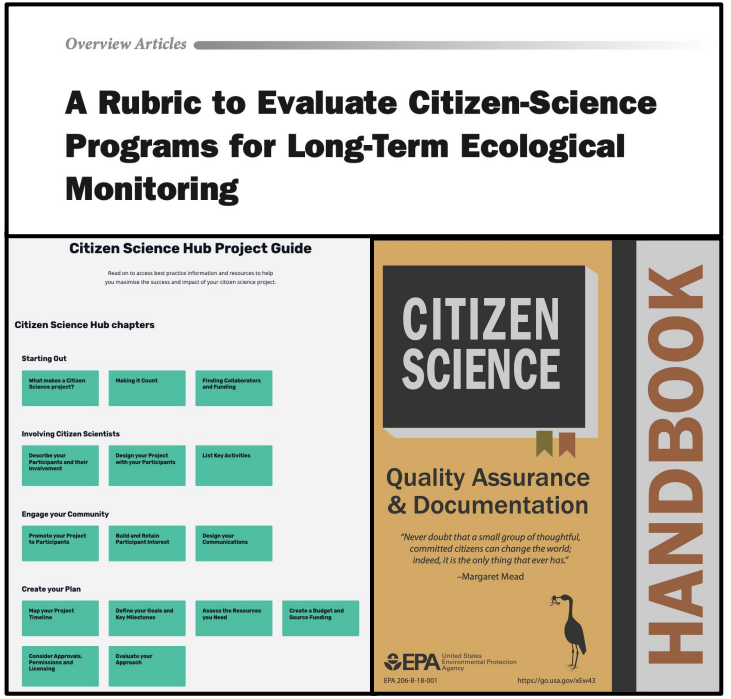
Game plan

1 **Interview prominent citizen scientists and analyze existing design resources**

2 **Use findings to update the EcoCentre's citizen science rubric**

3 **Develop and pilot a promotional workshop**

Interviews and literature analysis

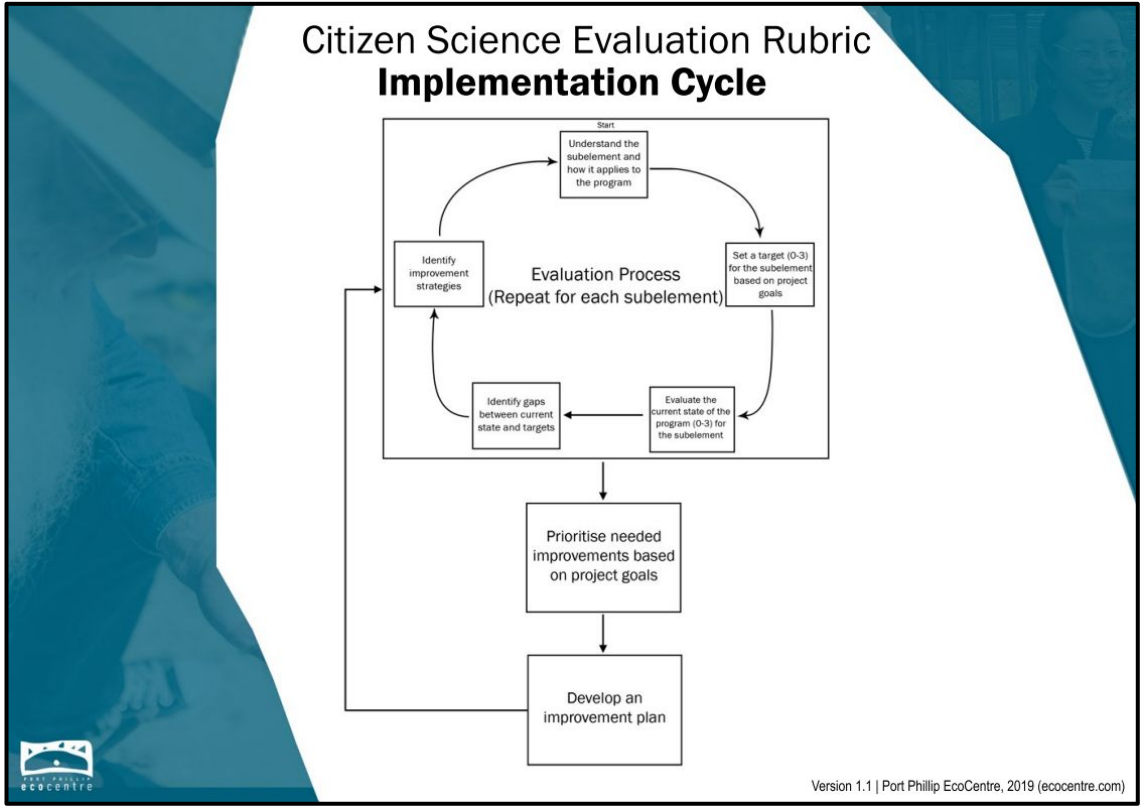


Key Findings and Rubric Updates

Rubric update overview

1. Introductory pages reimagined to guide users through using the rubric
2. Rubric format reworked to improve usability
3. New *Summary* section provides an overview of the evaluation process
4. New element and new subelements added

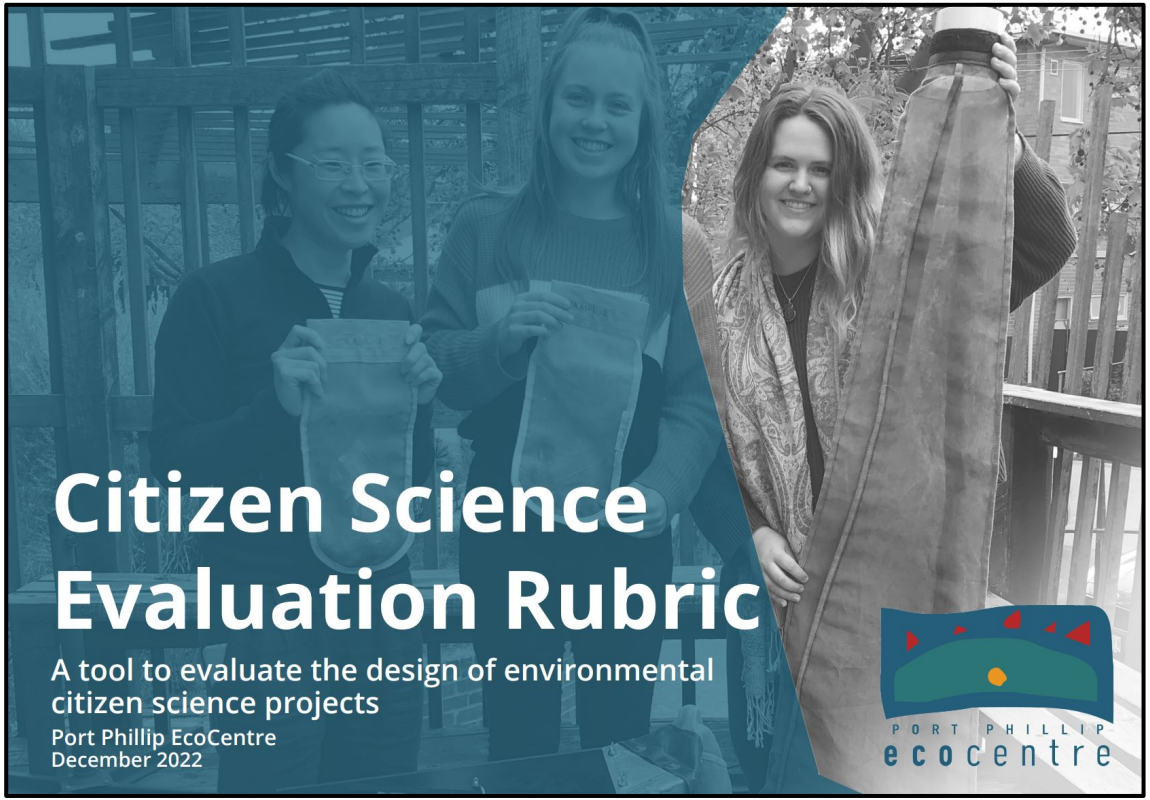
Introductory page was not intuitive



Reimagined introductory pages

Introduction:

- Why Choose Citizen Science
- Designing Strong Citizen Science
- The Four Elements of a Citizen Science Project
- How to Use the Rubric



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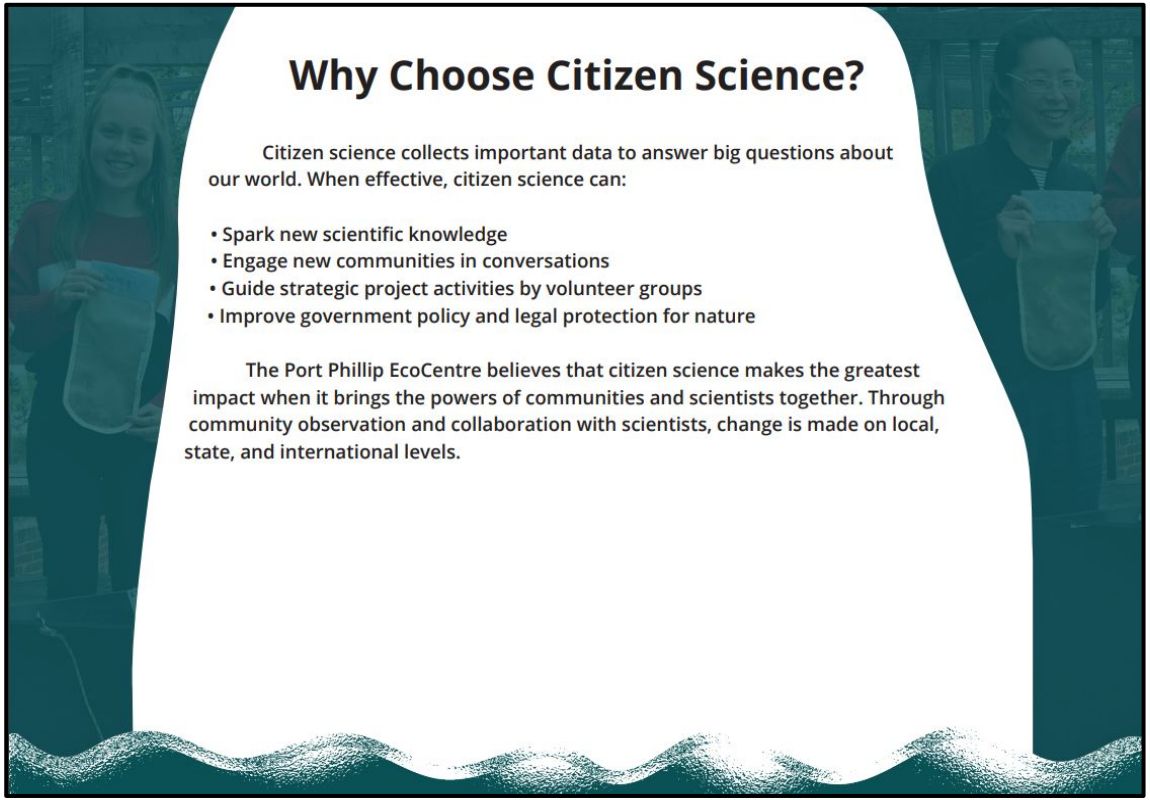

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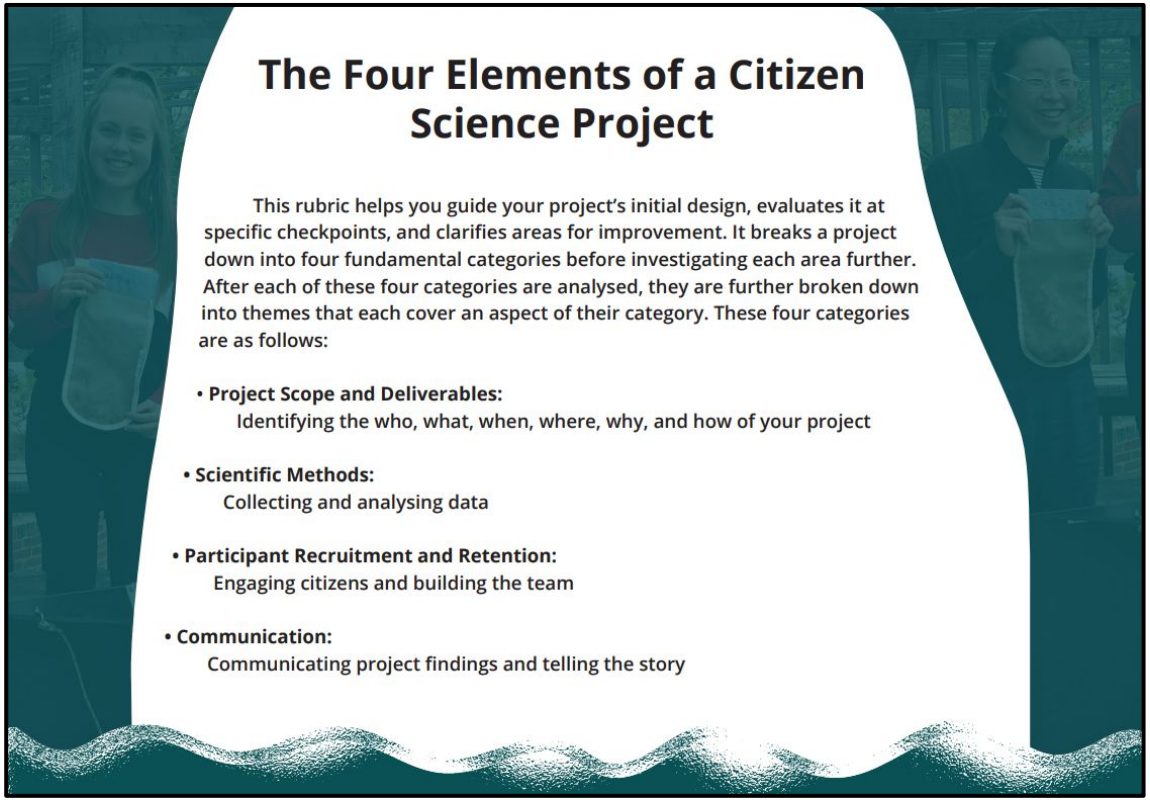

Reimagined introductory pages

Introduction:

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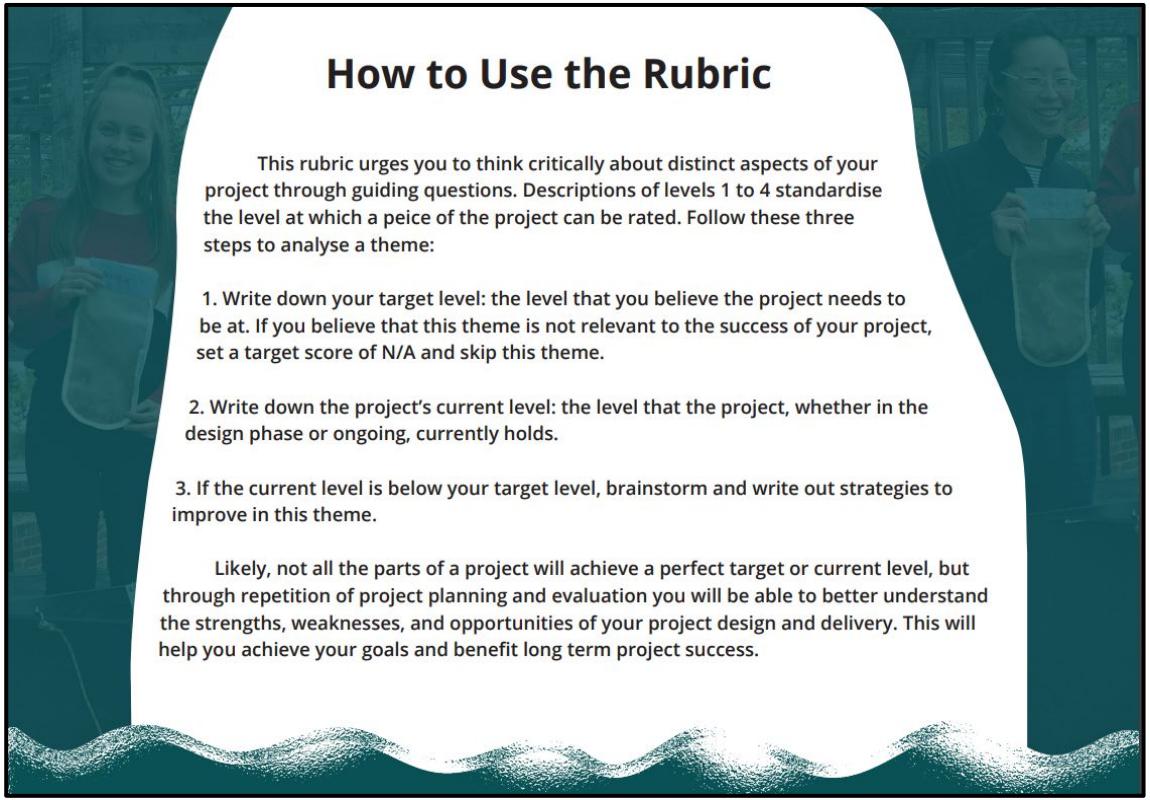
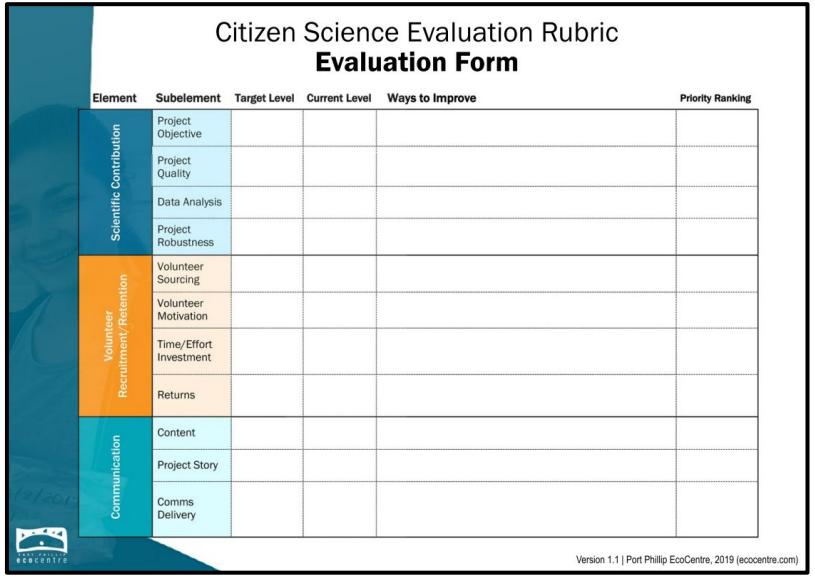
- **How to Use the Rubric**



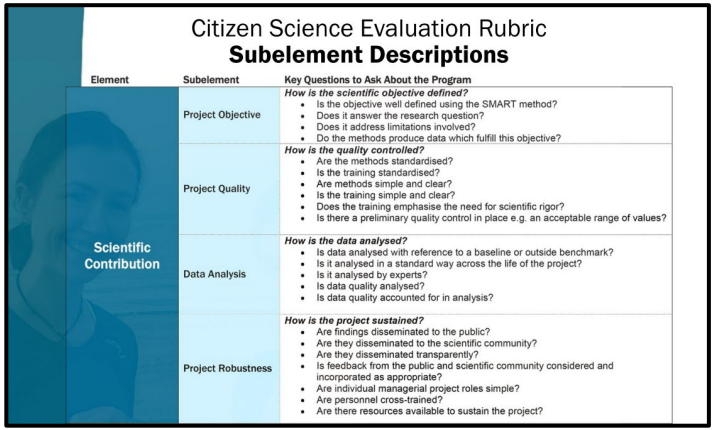
Subelement analysis was cumbersome



Citizen Science Evaluation Rubric
Evaluation Form

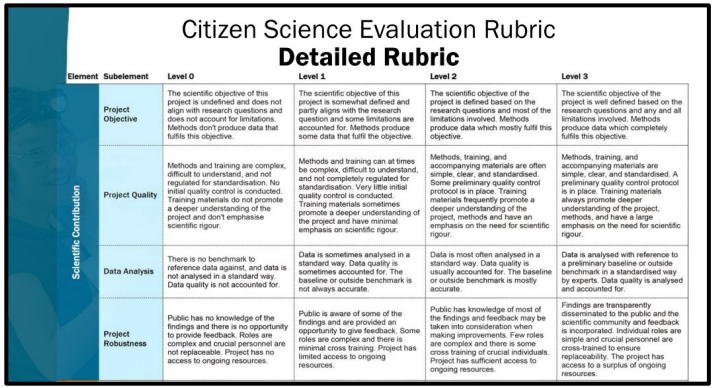
Element	Subelement	Target Level	Current Level	Ways to Improve	Priority Ranking
Scientific Contribution	Project Objective				
	Project Quality				
	Data Analysis				
	Project Robustness				
Volunteer Recruitment/Retention	Volunteer Sourcing				
	Volunteer Motivation				
	Time/Effort Investment				
	Returns				
Communication	Content				
	Project Story				
	Comms Delivery				

Version 1.1 | Port Phillip EcoCentre, 2019 (ecocentre.com)



Citizen Science Evaluation Rubric
Subelement Descriptions

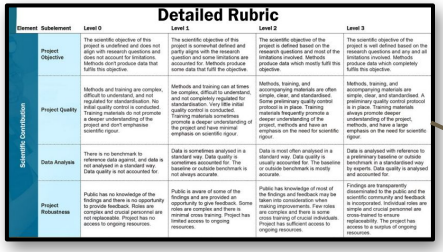
Element	Subelement	Key Questions to Ask About the Program
Scientific Contribution	Project Objective	***How is the scientific objective defined?*** • Is the objective well defined using the SMART method? • Does it answer the research question? • Does it address limitations involved? • Do the methods produce data which fulfill this objective?
	Project Quality	***How is the quality controlled?*** • Are the methods standardised? • Is the training standardised? • Are methods simple and clear? • Is the training simple and clear? • Does the training emphasise the need for scientific rigor? • Is there a preliminary quality control in place e.g. an acceptable range of values?
	Data Analysis	***How is the data analysed?*** • Is data analysed with reference to a baseline or outside benchmark? • Is it analysed in a standard way across the life of the project? • Is it analysed by experts? • Is data quality analysed? • Is data quality accounted for in analysis?
	Project Robustness	***How is the project sustained?*** • Are findings disseminated to the public? • Are they disseminated to the scientific community? • Are they disseminated transparently? • Is feedback from the public and scientific community considered and incorporated as appropriate? • Are individual managerial project roles simple? • Are personnel cross-trained? • Are there resources available to sustain the project?



Citizen Science Evaluation Rubric
Detailed Rubric

Element	Subelement	Level 0	Level 1	Level 2	Level 3
Scientific Contribution	Project Objective	The scientific objective of this project is undefined and does not align with research questions and does not account for limitations. Methods don't produce data that fulfils this objective.	The scientific objective of this project is somewhat defined and partly aligns with the research question and some limitations are accounted for. Methods produce some data that fulfil the objective.	The scientific objective of the project is defined based on the research questions and most of the limitations involved. Methods produce data which mostly fulfil this objective.	The scientific objective of the project is well defined based on the research questions and any and all limitations involved. Methods produce data which completely fulfils this objective.
	Project Quality	Methods and training are complex, difficult to understand, and not regulated for standardisation. No initial quality control is conducted. Training materials do not promote a deeper understanding of the project and don't emphasise scientific rigour.	Methods and training can at times be complex, difficult to understand, and not completely regulated for standardisation. Very little initial quality control is conducted. Training materials sometimes promote a deeper understanding of the project and have minimal emphasis on scientific rigour.	Methods, training, and accompanying materials are often simple, clear, and standardised. Some preliminary quality control protocol is in place. Training materials frequently promote a deeper understanding of the project, methods and have an emphasis on the need for scientific rigour.	Methods, training, and accompanying materials are simple, clear, and standardised. A preliminary quality control protocol is in place. Training materials always promote deeper understanding of the project, methods, and have a large emphasis on the need for scientific rigour.
	Data Analysis	There is no benchmark to reference data against, and data is not analysed in a standard way. Data quality is not accounted for.	Data is sometimes analysed in a standard way. Data quality is sometimes accounted for. The baseline or outside benchmark is not always accurate.	Data is most often analysed in a standard way. Data quality is usually accounted for. The baseline or outside benchmark is mostly accurate.	Data is analysed with reference to a preliminary baseline or outside benchmark in a standardised way by experts. Data quality is analysed and accounted for.
	Project Robustness	Public has no knowledge of the findings and there is no opportunity to provide feedback. Roles are complex and crucial personnel are not replaceable. Project has no access to ongoing resources.	Public is aware of some of the findings and are provided an opportunity to give feedback. Some roles are complex and there is minimal cross training. Project has limited access to ongoing resources.	Public has knowledge of most of the findings and feedback may be taken into consideration when making improvements. Few roles are complex and there is some cross training of crucial individuals. Project has sufficient access to ongoing resources.	Findings are transparently disseminated to the public and the scientific community and feedback is incorporated. Individual roles are simple and crucial personnel are cross-trained to ensure replaceability. The project has access to a surplus of ongoing resources.

Reorganized workflow



Detailed Rubric

Element	Subelement	Level 0	Level 1	Level 2	Level 3
Scientific Contribution	Project Objective	The scientific objective of this project is undefined and does not address any research questions and does not account for limitations. Methods don't produce data that fulfils this objective.	The scientific objective of this project is somewhat defined and addresses the research question and some limitations are accounted for. Methods produce some data that fulfil the objective.	The scientific objective of the project is defined based on the research questions and most of the limitations involved. Methods produce data which mostly fulfil this objective.	The scientific objective of the project is well defined based on the research questions and all any and all limitations involved. Methods produce data which completely fulfils this objective.
	Project Quality	Methods and training are complex, difficult to understand, and not regulated for standardisation. No preliminary quality control protocol. Training materials do not promote a deeper understanding of the project and don't emphasise scientific rigour.	Methods and training can at times be complex, difficult to understand, and not completely regulated for standardisation. Very little initial quality control is conducted. Training materials sometimes promote a deeper understanding of the project and have minimal emphasis on scientific rigour.	Methods, training, and accompanying materials are often simple, clear, and standardised. Some preliminary quality control protocol is in place. Training materials frequently promote a deeper understanding of the project, methods and have an emphasis on the need for scientific rigour.	Methods, training, and accompanying materials are simple, clear, and standardised. A preliminary quality control protocol is in place. Training materials always promote deeper understanding of the project, methods, and have a large emphasis on the need for scientific rigour.
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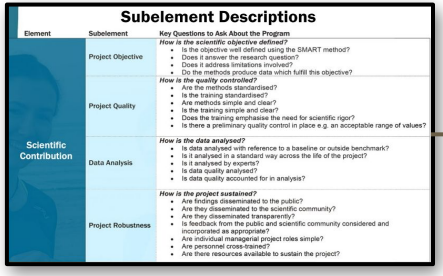
	Project Robustness	Public has no knowledge of the findings and there is no opportunity to provide feedback. Roles are complex and crucial personnel are not cross-trained. There is no access to ongoing resources.	Public is aware of some of the findings and are provided an opportunity to give feedback. Some roles are complex and there is minimal cross training. Project has limited access to ongoing resources.	Public has knowledge of most of the findings and feedback may be taken into consideration when making improvements. Few roles are complex and there is some cross training for crucial individuals. Project has sufficient access to ongoing resources.	Findings are transparently communicated to the public and the scientific community and feedback is incorporated. Individual roles are simple and crucial personnel are cross-trained to ensure replaceability. The project has access to a surplus of ongoing resources.



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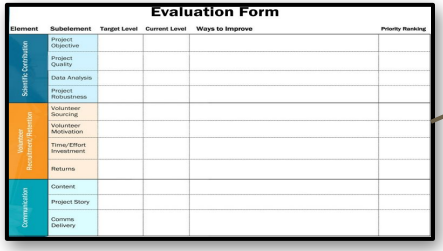

Evaluation Form

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	Returns				
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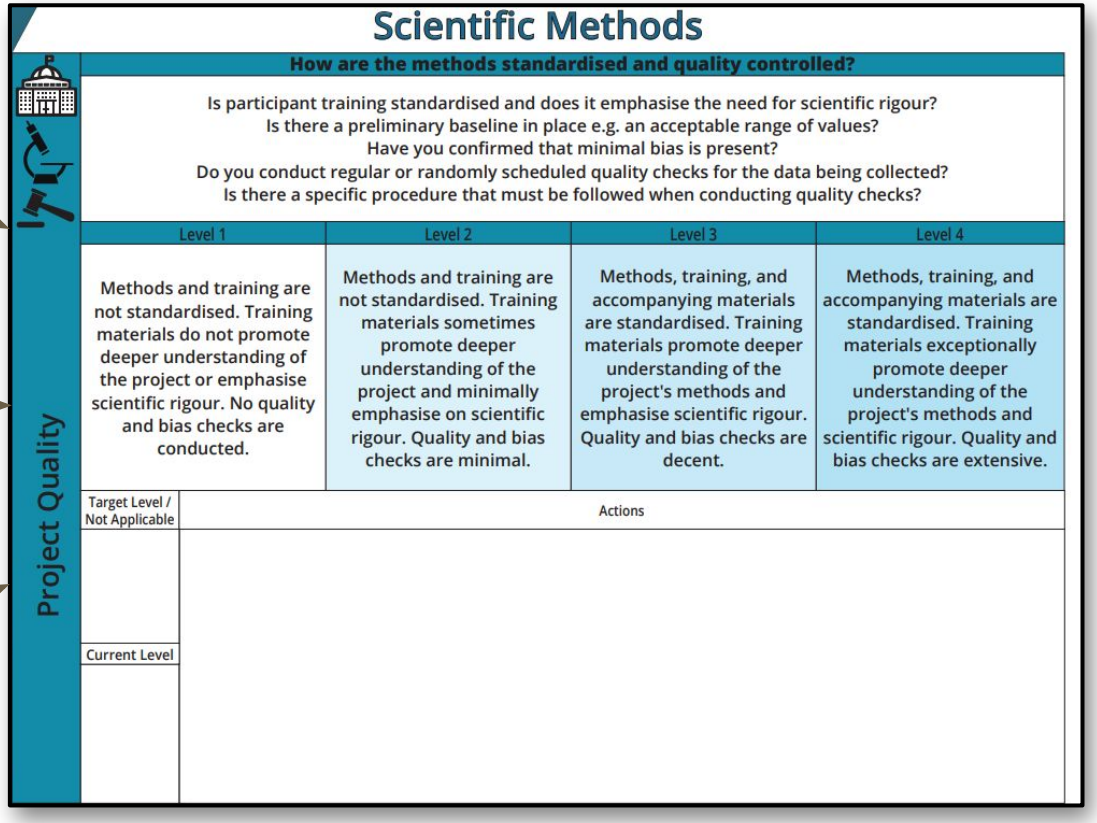
	Project Story				
	Comms Delivery				



Scientific Methods

How are the methods standardised and quality controlled?

Is participant training standardised and does it emphasise the need for scientific rigour?
Is there a preliminary baseline in place e.g. an acceptable range of values?
Have you confirmed that minimal bias is present?
Do you conduct regular or randomly scheduled quality checks for the data being collected?
Is there a specific procedure that must be followed when conducting quality checks?

Project Quality

Level 1	Level 2	Level 3	Level 4
Methods and training are not standardised. Training materials do not promote deeper understanding of the project or emphasise scientific rigour. No quality and bias checks are conducted.	Methods and training are not standardised. Training materials sometimes promote deeper understanding of the project and minimally emphasise on scientific rigour. Quality and bias checks are minimal.	Methods, training, and accompanying materials are standardised. Training materials promote deeper understanding of the project's methods and emphasise scientific rigour. Quality and bias checks are decent.	Methods, training, and accompanying materials are standardised. Training materials exceptionally promote deeper understanding of the project's methods and scientific rigour. Quality and bias checks are extensive.

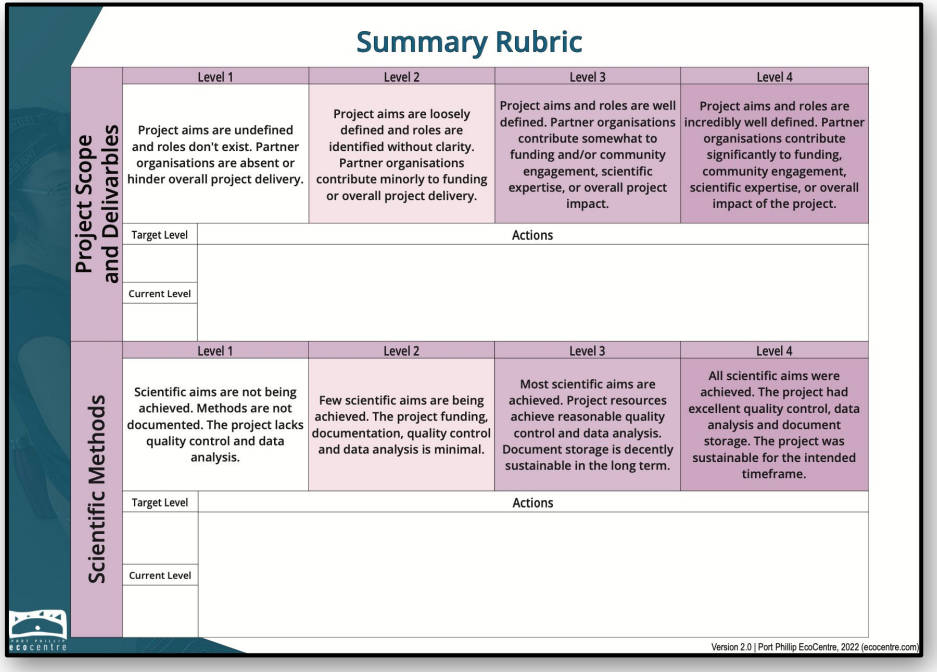
Target Level / Not Applicable	Actions
Current Level	

Summarizing a project is valuable

“Utilizing a full rubric, while that would be probably best practice, is not something that we all have time to do… So something that summarizes and touches on the key elements would be a handy starting point”
- Kade Mills, VNPA ReefWatch Coordinator

Quote has been lightly edited for concision and readability

Summary section



Summary Rubric

Project Scope and Deliverables

Level 1	Level 2	Level 3	Level 4
Project aims are undefined and roles don't exist. Partner organisations are absent or hinder overall project delivery.	Project aims are loosely defined and roles are identified without clarity. Partner organisations contribute minorly to funding or overall project delivery.	Project aims and roles are well defined. Partner organisations contribute somewhat to funding and/or community engagement, scientific expertise, or overall project impact.	Project aims and roles are incredibly well defined. Partner organisations contribute significantly to funding, community engagement, scientific expertise, or overall impact of the project.

Target Level	Actions
Current Level	

Scientific Methods

Level 1	Level 2	Level 3	Level 4
Scientific aims are not being achieved. Methods are not documented. The project lacks quality control and data analysis.	Few scientific aims are being achieved. The project funding, documentation, quality control and data analysis is minimal.	Most scientific aims are achieved. Project resources achieve reasonable quality control and data analysis. Document storage is decently sustainable in the long term.	All scientific aims were achieved. The project had excellent quality control, data analysis and document storage. The project was sustainable for the intended timeframe.

Target Level	Actions
Current Level	

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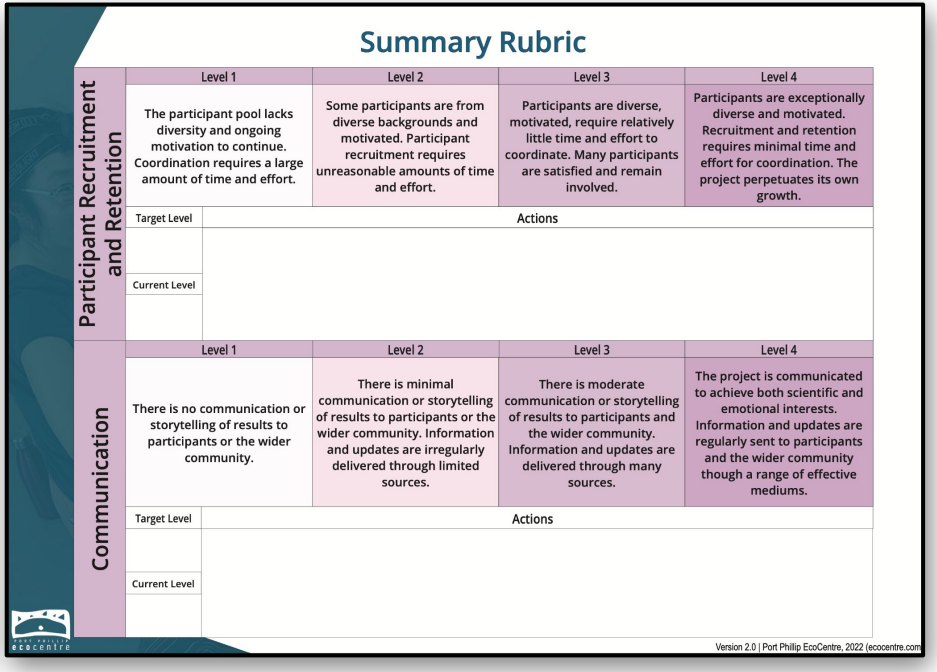

Summary Rubric

Participant Recruitment and Retention

Level 1	Level 2	Level 3	Level 4
The participant pool lacks diversity and ongoing motivation to continue. Coordination requires a large amount of time and effort.	Some participants are from diverse backgrounds and motivated. Participant recruitment requires unreasonable amounts of time and effort.	Participants are diverse, motivated, require relatively little time and effort to coordinate. Many participants are satisfied and remain involved.	Participants are exceptionally diverse and motivated. Recruitment and retention requires minimal time and effort for coordination. The project perpetuates its own growth.

Target Level	Actions
Current Level	

Communication

Level 1	Level 2	Level 3	Level 4
There is no communication or storytelling of results to participants or the wider community.	There is minimal communication or storytelling of results to participants or the wider community. Information and updates are irregularly delivered through limited sources.	There is moderate communication or storytelling of results to participants and the wider community. Information and updates are delivered through many sources.	The project is communicated to achieve both scientific and emotional interests. Information and updates are regularly sent to participants and the wider community though a range of effective mediums.

Target Level	Actions
Current Level	

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Project scope should not be overlooked

Project Scope and Deliverables element

Project Objectives

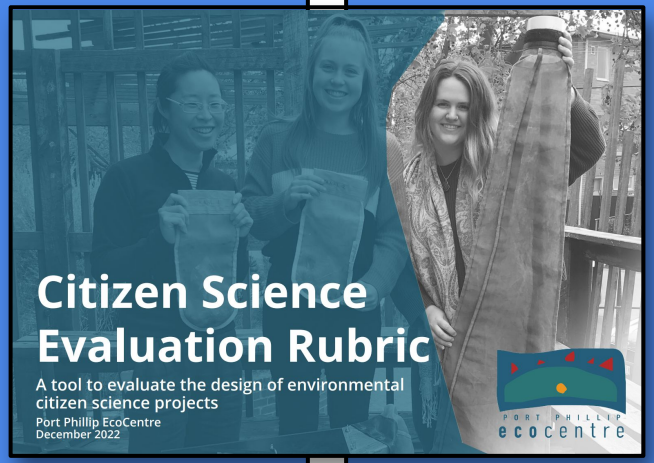
Managing Partnerships

Delegation of Roles

The new rubric

Content Additions

- Project Scope and Deliverables
- Documentation
- Precision in Communication
- Long Term Engagement
- Regular Quality Checks



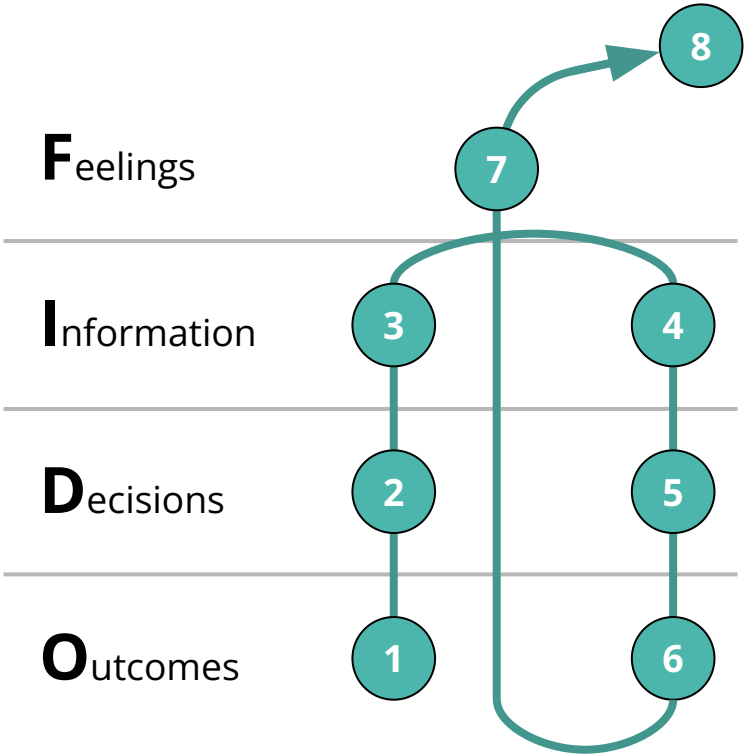
User Experience Enhancements

- New Introductory Pages
- Reimagined Workflow
- Added Summary Section
- Language Simplified
- Not Applicable Level Added

Disseminating the Updated Rubric

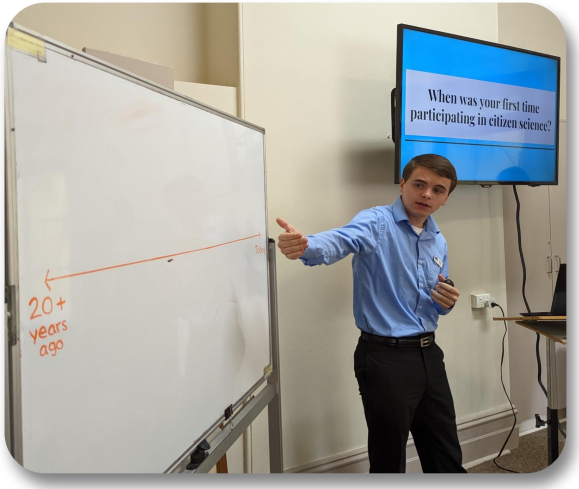
Delivering a promotional workshop

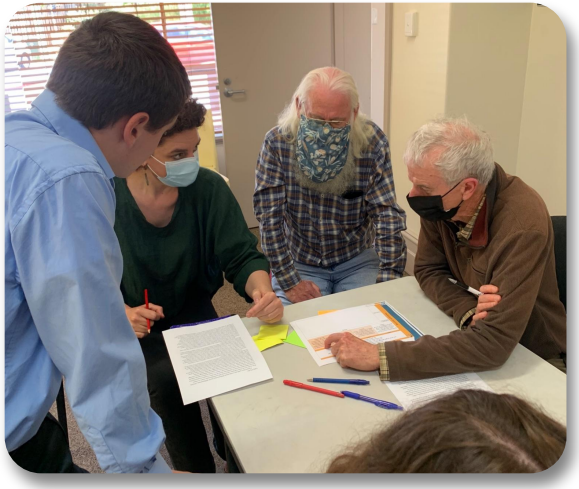
The FIDO metaprocess guided design



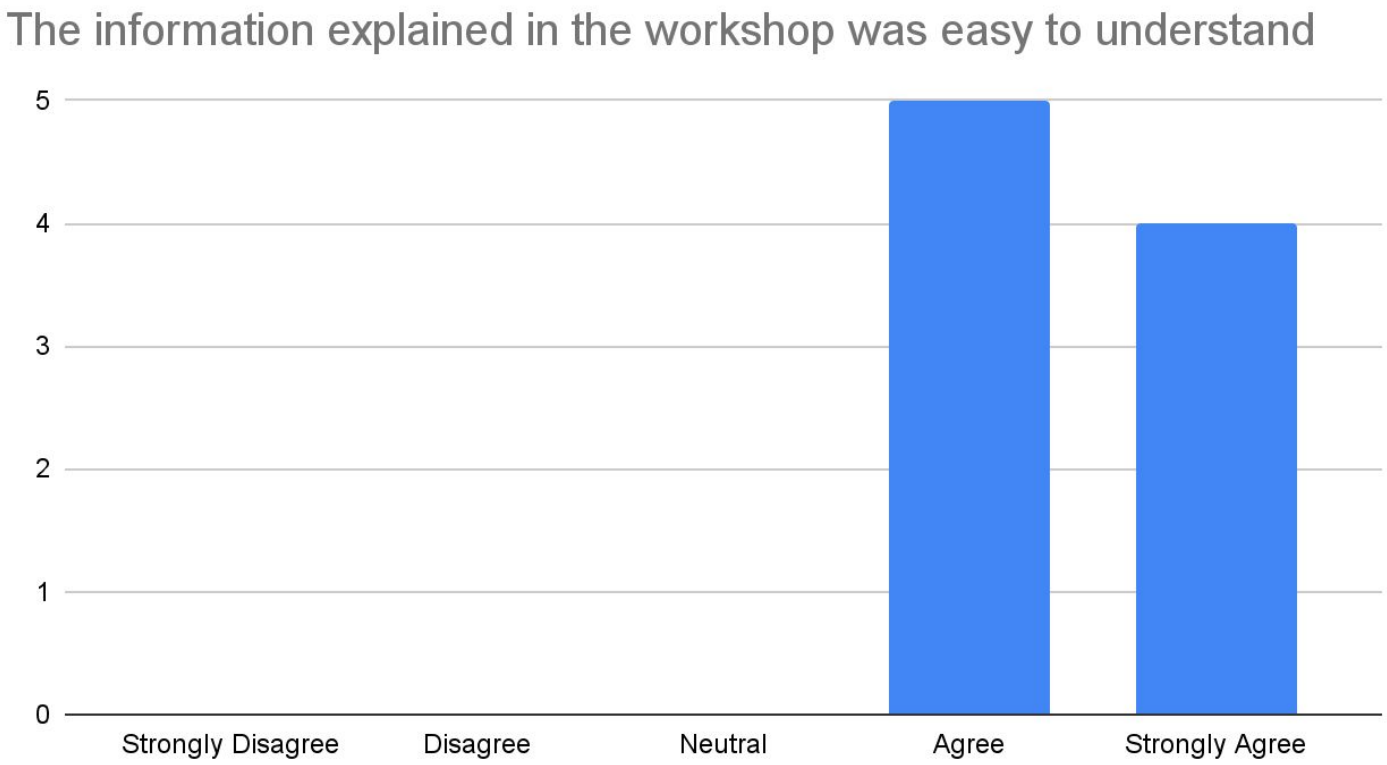
Adapted from Enablers of Change

Interactive design engaged participants





Constructive and optimistic feedback



Moving Forward

Next steps: rubric

Create a digital interactive version of the rubric

Further simplify the rubric's language

Advertise the rubric with a blog post and increase website visibility

Next steps: workshop

Refine the workshop using feedback from the pilot

Present the workshop at citizen science related conferences

The bigger picture

1 Improving Citizen Science

Enacting Change 2

3 Protecting the Environment

Acknowledgements

We would like to give a special thanks to:

All of our interviewees

People at the EcoCentre:
- ➔ Michelle Fisher
- ➔ Neil Blake
- ➔ April Seymore
- ➔ Fam Charko
- ➔ Betsabe Ortiz

And our advisors:
- ➔ Professor Holly Ault
- ➔ Professor Stephen McCauley

References

Days away from lightweight bag ban [Online Image]. (2022). News South Wales Environmental Protection Authority. https://www.epa.nsw.gov.au/-/media/epa/corporate-site/images/news-and-media/1825_plastics_ban_social_1080x1080_bag_v2_jpg.jpg

Kilvert, N. (2020, September 4). 'life out of balance': Major study evaluates 'Screen time' vs 'green time' and the consequences for kids. ABC News. Retrieved December 9, 2022, https://www.abc.net.au/news/science/2020-09-05/screen-time-mental-health-kids-adolescents/12612454