Community science approaches
Part A: Introduction to community science

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SPHEIR Strategic Partnerships for Higher Education Innovation and Reform

Topic/Lesson

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  - Why use community science?
  - Challenges of community science
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Introduction

This lesson will introduce the concept of community science, provide information on its use, benefits and challenges. Finally, the future of community science will be discussed.

Objectives

- To be able to describe the key defining features of community science
- To be able to discuss the advantages and disadvantages of using a community science approach
- To be able to compare and contrast the use of community science to non community science focused scientific studies.

WHAT IS COMMUNITY SCIENCE?

Defining community science

Research in which non-scientists play a role in project development, data collection, or discovery and is subject to the same system of peer review as conventional science [1]

It is also known by other terms such as citizen science, crowd science, crowd-sourced science, civic science, or volunteer monitoring

[1] Ryan et al. 2018

Community science

- Anyone can volunteer and then become involved in research by taking part in data collection, data analysis or a range of other research based tasks

- It is an approach to scientific research where the public have an opportunity to work alongside trained scientists

Community science aims

- Community science projects attempt to achieve two overall aims:
  - Collect data & information for scientific research [1]
  - Create a platform for knowledge exchange [2]

[1] Silvertown, (2009) [2] Berditchevskaia et al. (2017)

Water Quality Community sc

- Water resources science is characterised by gaps in data both spatially and temporally [1].
- There is also a public water awareness gap [2].

- As community science provides a way to communicate to and educate the public, whilst also collecting data it may be used to help provide solutions to the two above issues.

[1] Hannah et al., (2011) [2] Brouwer et al., 2018

Community science framewo

- How a community science projects operate can vary significantly between different projects [1]

- Projects often change depending on factors such as:
  - The amount of resources within the project
  - The complexity of the research
  - The role volunteers can play

[1] Capdevila et al., (2020).

Community science projects

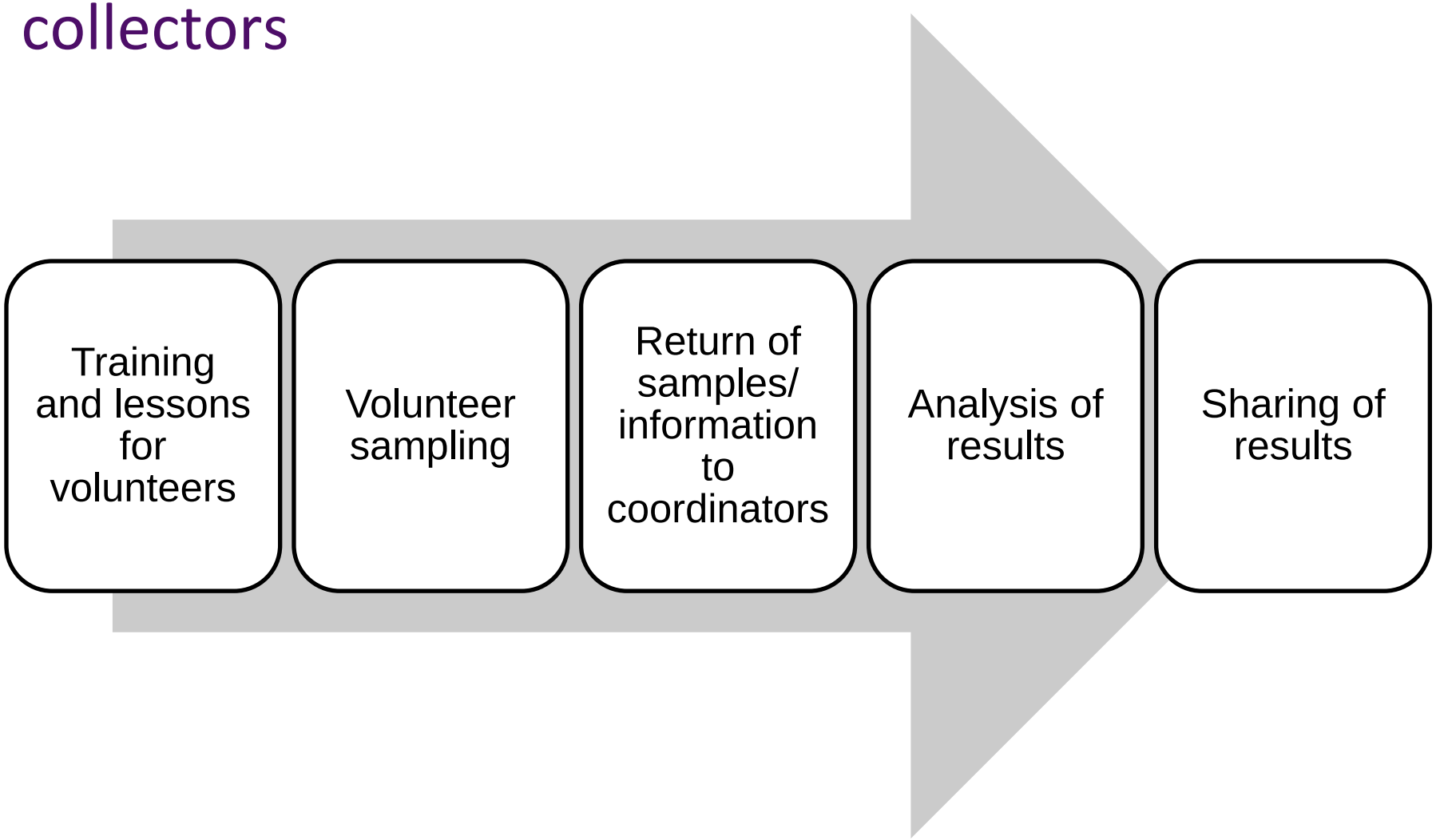
- Observation and identification of animals and plants for studies on biodiversity.
- Analysis of images for astronomy research
- Environmental quality research e.g., water or soil quality

Volunteer photographing and recording plant species

Photo by Cassi Saari, CC BY-SA 4.0,(Accessed 12/04/21) https://commons.wikimedia.org/w/index.php?curid=100180154

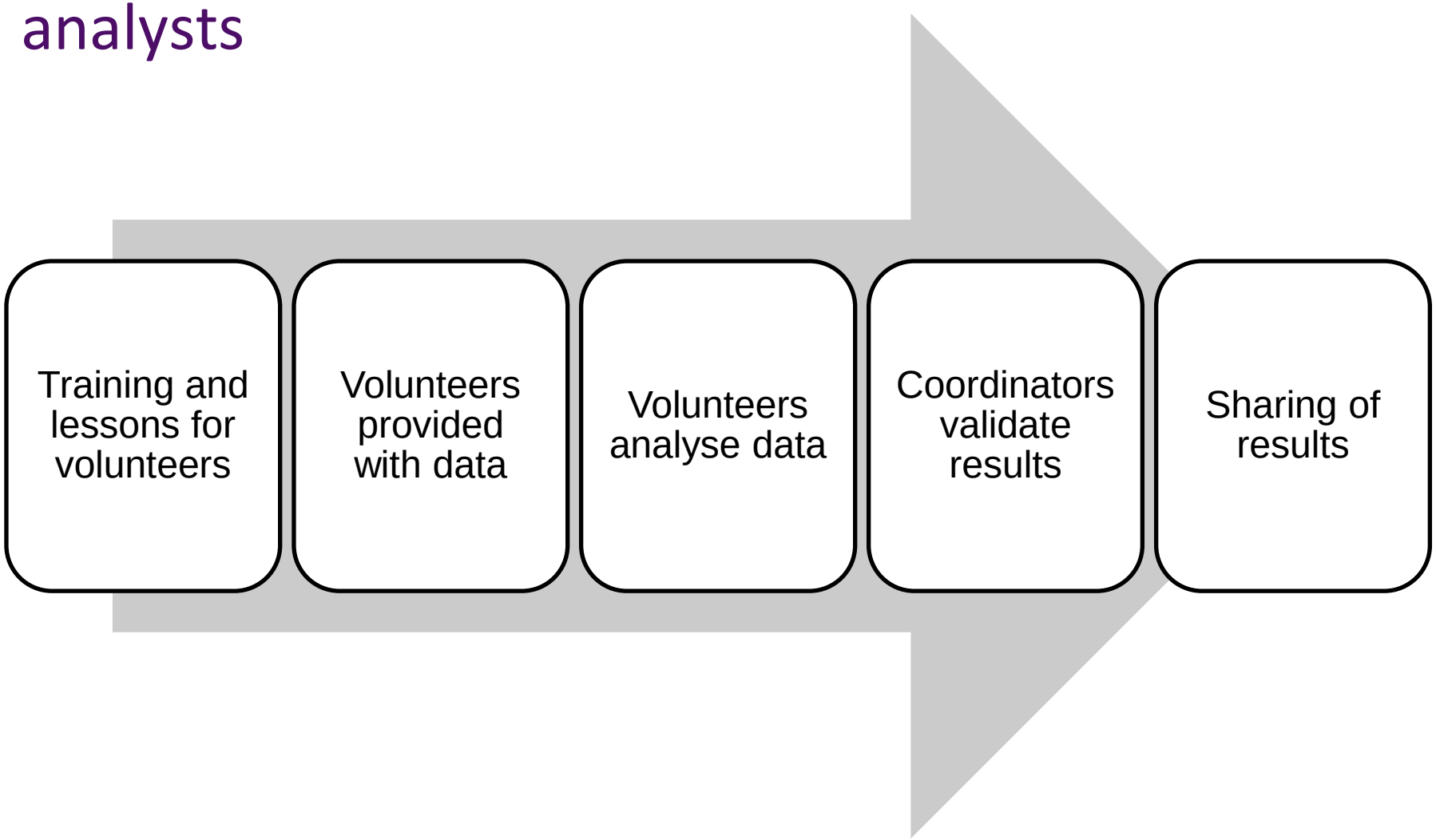
Community science framework

Example framework where volunteers act as data collectors



Community science framework

Example framework where volunteers act as data analysts



WHY USE COMMUNITY SCIENCE?

Data collection efficiency

- >1000 volunteers can be involved in some community science projects, meaning data collection can be on a large scale.

- Projects can obtain or manage scientific information at scales or resolutions unattainable by individual researchers [1].

- Able to speed up scientific discovery [2], and at a fraction of the cost [3].

[1] Bonney et al., 2014, [2] Ryan et al. 2018, [3] Silvertown, 2009.

New research opportunities

- Community science is capable of researching difficult to quantify research areas [1].

- As such, community science has resulted in new scientific discoveries [2], e.g., studies have shown range shifts of bird species as a result of global climate change by utilising community science [3]

[1] Ricciardi et al., 2000, [2] Ryan et al., 2018, [3] Louv and Fitzpatrick, 2012, pg.20

Raising Awareness

- There can be a divide between the specialist knowledge of scientists and the public [1].

- Community science creates a pathway for knowledge exchange within and outside of academia [1]

- Community science has the potential to bridge the public awareness gaps [2], by involving the public directly into science.

[1] Berditchevskaia, et al., (2017), [2] Brouwer et al., (2018)

CHALLENGES OF COMMUNITY SCIENCE

Critics of community science

- Criticism of community science does exist e.g. [1].
- Community science requires a different approach to how science is most often conducted.
- These changes (such as the use of volunteers as data collectors) have resulted in criticism.

[1] Buytaert et al., (2014

Data quality

- Some scientists believe community science can lead to a compromise in data quality [1]
- Compromise in data quality comes from the requirement of different approaches used in community science designs [2]
- Whilst community science is not perfect, it can be argued no data is [3] and therefore, “the fear that some may have should not stop its use” [4]. But work should continue to improve its quality.

[1] Buytaert et al., (2014), [2] Cohn, 2008, [3] Szabo, Fuller and Possingham, (2012), [4] Tulloch et al., 2013

Validation of data

- To improve data quality, data validation is used in community science [1].
- Data validation is conducted by coordinators to check the volunteer's results [1].
- Studies (e.g., [1],[2] and [3]) have shown that the results collected by volunteers can be as accurate as professionals

[1] Kosmala et al., (2016), [2] Wiggins et al., (2011), [3] Bonney et al., (2014).

THE TRENDS AND FUTURE OF COMMUNITY SCIENCE

Continued & increased use

- Surveys show that experts believe community science will continue to grow into the future [1].

- Due to the growth in interest, experts believe the involvement of the public will increase, including more public driven science initiatives [1].

[1] Brouwer et al., (2018)

Further improvements

- Community science is continually improving as its growing use is providing lessons on how best to apply community science for both data collection and knowledge exchange.

- Community science continues to become easier and more efficient than ever as technology improves [1].

[1] Buytaert et al., (2014)

SUMMARY

Summary

- Community science is an approach to scientific research by using the public
- Community science provides new opportunities to research, particularly due to its efficiency in data collection
- Community science has limitations but is still a powerful tool for research and engagement

LEARNING EXERCISE

Learning exercises

- Investigate what community science projects exist and how they differ with volunteer involvement

- See which project interests you and see if you could volunteer.

- Think about what you think are the key challenges of community science and if you think it could be used more in the future.

REFERENCES & FURTHER RESOURCES

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Further Resources

A study on the use of community science

Zheng, H., Hong, Y., Long, D., and Jing, H.: Monitoring surface water quality using social media in the context of citizen science, Hydrol. Earth Syst. Sci., 21, 949–961, https://doi.org/10.5194/hess-21-949-2017 , 2017. **(OA)**

Two websites with accessible community science projects

https://www.inaturalist.org/

https://www.zooniverse.org/

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