TOPIC: COMMUNITY SCIENCE APPROACHES

SUB-TOPIC: PART A: AN INTRODUCTION TO COMMUNITY SCIENCE

Supporting Transcript

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Slide 1

Hello, my name is Sam Addison and welcome to this lesson on community science approaches. The lesson community science approaches is a two part lesson, and Part A which is this lesson will be an introduction to community science.

Slide 2

In this lesson we will have a brief introduction and discuss the objectives of the lesson. We will then have a section talking about what community science is, why scientists choose to use community science, the challenges that face the use of community science and finally the trends and future of community science. Following this, I will then introduce some learning exercises focused on the lesson, that you may wish to talk part in to further your learning.

Slide 3

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. The lesson will discuss community science more generally over a range of scientific fields. Part B called community science & water quality will build on the knowledge learnt in this lesson and will focus on community science and its use for water quality science.

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The objectives of this lesson are to firstly be able to describe the key defining features of what makes community science, then to be able to discuss the advantages and disadvantages of using a community science approach. The last objective is to be able to compare and contrast the use of community science to non-community science focused scientific studies.

Slide 5 – Section Break

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What is community science? The definition of community science can vary between different studies however, generally the most accepted definition is that community science is scientific research that involves public participation or non-scientists.

Community science is also known by other terms and these terms include citizen science, crowd science, crowd-sourced science, civic science, or volunteer monitoring.

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Community science provides a unique opportunity for the public to become involved in scientific research. According to the design of a project, in principle 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. Sometimes volunteers need to meet certain eligibility criteria to become involved.

Typically, scientific research is conducted by professional scientists. However, in community science as the public are involved it means that professional and non-professional scientists can work together to undertake scientific research.

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Community science provides two key benefits, and these are the aims of community science projects. The first aim is to collect data and information for scientific research and the second aim is to create a platform for knowledge exchange.

Different community science projects may prioritise one aim over the other, for example some projects may focus more on collecting data and results whilst other projects may focus more on education for volunteers. Importantly however, most projects will target these 2 aims and lead to both education and scientific research.

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Despite the importance of science related to water resources and quality, there are gaps in data both spatially and temporally across the world. Additionally, there is also a public water awareness gap, meaning that the specialist knowledge of scientists regarding water is often not known by the public.

Because of these two issues in data gaps and awareness gaps, it means that new approaches may be welcome to help provide solutions to reduce both gaps. Therefore, community science as it provides a method of communicating and educating the public whilst also being able to conduct research and collect data, it may be able to contribute to the solution.

Slide 10

How community science projects operate varies significantly between different projects. Projects differ depending on many factors.

Factors that impact a project include the resources available within the project. More resources would allow for more training and more involvement of the volunteers. Equally the more complex the research the volunteers would be less able to fully volunteer throughout the scientific process.

As discussed on the previous slide, the aim of a community science project changes how the general approach is made. Some projects will focus more on scientific research and less on education whilst other projects may focus on education and less so on the scientific research outcomes. If a project is focused more upon education, then volunteers are more likely to be involved in the whole scientific process, whilst if the scientific research is the primary focus of the project, then volunteers may contribute towards a certain aspect e.g., data collection.

Slide 11

Community science can be used in many fields of science.

Some of the most commonly implemented fields include studies in biodiversity where volunteers observe and identify animals and plants. Volunteers within these projects can record their observations during everyday life with their phones and send the information to organisers of the given project. Astronomy is another area of research where community science has been heavily used where volunteers contribute to analysis of photos via the internet. And lastly and more related to this course, is environmental quality research. Community science projects have used volunteers in research of water quality, soil, and air quality.

Slide 12

As discussed, community science projects can vary widely. However, to provide a general example of how a project may work where volunteers are involved in the project and collect data is shown here. Firstly, volunteers are provided with training and lessons. Following training, the volunteers collect data and return the data to the coordinators, the coordinators would analyse the results and use their specialist knowledge to use the results effectively. Then the results would be shared with the volunteers and the specialist knowledge can be shared and further teach about the project and science surrounding it.

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Another example of a project framework is shown, in this example the volunteers act as data analysts. In this project training and lessons would be provided to the volunteers but volunteers are provided with data in which they analyse, the data may be in the form of photographs, documents or videos. The results of the volunteers' analysis would be sent to the coordinators who would compile the results and further analyse the results. As before, the results would then be shared with all of the volunteers.

Slide 14 – Section Break

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So, while we now know what community science is. Why do scientists use it?

Firstly, one of the most commonly identified reasons is that the data collection efficiency of community science is generally greater than other scientific research methods. Therefore, if researchers want to collect data on a large scale, community science is a useful method and some community science projects have obtained scientific information that would not have been possible by other methods.

Furthermore, whilst being able to collect large amounts of information, community science is usually able to do this more cheaply therefore, saving costs and allowing more research to be conducted. And it also means that scientific discovery can have the potential to be faster.

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Linked to the efficiency in data collection, community science provides new research opportunities.

Community science programmes have a proven track record of making significant contributions and surprising scientific discoveries by being able to observe otherwise difficult to quantify phenomena. An example of this would be that community science studies have shown range shifts of bird species as a results global climate change. In this example, a team of scientists would struggle to collect a large enough volume of observations of bird species and over a large enough geographical region. However, in a community science project, thousands of people over national and international geographical

regions can collect data and contribute to one project meaning that data can be collected on a scale that is not easily possible by a team of scientists.

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Another benefit of community science is the raising of awareness that is a part of the project. As we mentioned earlier, community science is a platform for the exchange of knowledge. Often there can be a divide between the specialist knowledge of scientists and the public and community science creates a pathway for knowledge both in and outside of academia. This allows for the divide in knowledge to be reduced and increase public awareness of important issues such as water quality.

Importantly, whilst other methods of raising awareness are possible within communities, community science represents a method of communicating scientific knowledge that people can access and understand more easily. Perhaps most importantly the knowledge gained within community science projects people are more likely to trust, as they are part of the collected knowledge.

Slide 18- Section Break

Slide 19

Whilst community science has many advantages, it is does face both challenges and criticism.

The challenges and criticism is caused by the changes that community science leads to from how science is most often conducted. The changes often are a result of the use of volunteers and the impact that they may have on the scientific research. As volunteers are not trained scientists, some are concerned that this may impact negatively on community science research.

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The most significant concern regarding the volunteers' impact is the impact on the quality of data that is collected, as some scientists believe that community science data is poorer than data collected by non-community science projects. Importantly, whilst community science may not currently be perfect, no data can be and therefore work is continuing to develop and improve community science and data quality.

The reason as to why data quality may become a concern currently is that the different approaches that are required in a community science project can lead to less reliability. An example of this would be that the scientists who analyse the data, will not see the collection of the data as that may be conducted by volunteers. In this scenario it means that how the data collected may be a worry. However, due to these concerns, it means that community science projects provide approaches to counter act these concerns, which will be discussed on the next slide.

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Whilst there are many ways in which data quality can be improved in scientific research, the main method implemented into community science is data validation.

Data validation is where scientists and coordinators of the community science project check the volunteers' results. This can be achieved in a number of ways and depends on the project. In a water quality project, the scientists may go to the same location as a volunteer and sample the same water to see if they gain the same results or in a biodiversity study a scientist may check that volunteer is correctly identifying animal or plant species correctly.

Through data validation, many studies have shown that data and results collected by volunteers can be as accurate as that collected by professional scientists.

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Surveys of experts have shown that experts believe that community science will continue to grow into the future and become more important. With this growth and increased interest into community science, experts believe that the involvement of public within professional science will increase and that science conducted by the public and importantly driven by the public will increase.

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Whilst community science is growing, it is also becoming better than even before and the future will see further improvements.

Community science is improving as more lessons are learned. Scientists are learning how to apply community science to achieve their aims more effectively and efficiently.

However, not only is community science improving because of the learning of lessons, but improvement of community science is occurring as it is becoming easier and more efficient than ever as technology improves and new opportunities occur. Communication technologies such as the internet allows for much easier knowledge generation, data analysis and research design.

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In summary there are 3 key points to take from this lesson. Number 1: community science is an approach to scientific research by using the public. The second point is that community science provides new opportunities to research, particularly due to its efficiency in data collection. Finally, community science does have limitations but, it is still a powerful tool for research and engagement.

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For the learning exercises as part of this lesson, the first one is to investigate what community science projects exist and these can be searched on the internet. See how the different projects operate and how volunteers can contribute differently. Whilst investigating the different projects you may be able to find one that interests you and be able to volunteer. On the following slides which show further resources there are links to websites that provide information on different projects that anyone can participate in.

Finally, the last learning exercise is to think about the challenges that may face community science and to think about if it could be more used in the future and if so, how?

Slide 29 – Section Break

Slide 30-31

This is a list of the references that have been used in the lesson and which can provide further information on the topics of the lesson.

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For further resources, the link to a study using community science to investigate water quality is on the slide. Also, there are two links to two websites that have community science projects where you will be able to look at a range of community science projects and look at what they are aiming to achieve and how you yourself could be involved.

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Thank you, for listening and I hope you enjoyed learning about community science.