Citizen Science in the Classroom

~ Sujata C

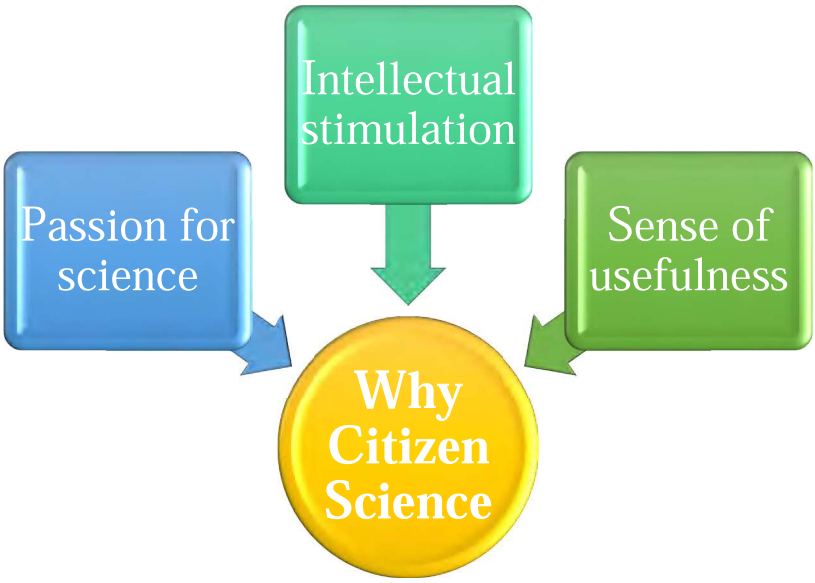
Citizen science is a centuries old idea but if it were to be explained in the 21st century context and terminology, we could call it crowdsourced science[1]. Citizen science research is a bottom-up approach to investigation driven by people (mostly amateur scientists) who contribute to live projects. Simply put, it is the collection and analysis of data relating to the natural world by members of the public, typically as part of a collaborative project with professional scientists, as explained in the Oxford Advanced Learners' Dictionary.

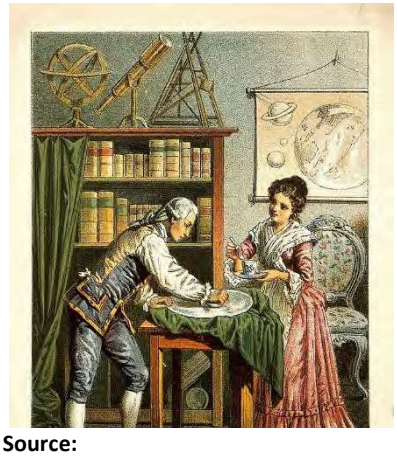
A citizen scientist is an ordinary person who volunteers his time to discover, collate, explain, and reveal a scientific secret. Man is one of the most inventive and creative creatures that walks the Earth. It is hard to keep a sharp mind down. The natural world is intriguing and vast, and it is not surprising that it invites observation by all living things, not just man alone. The act of observing is inherent to human nature as it is the primary mode of acquiring information through the five senses. As Leonardo da Vinci said, "Science is the observation of things possible." With the availability of high-end technology to the common

[1] Obtain (information or input into a particular task or project) by enlisting the services of a large number of people, either paid or unpaid, typically via the internet.

man so simply and easily through a click on their smartphones, it is quite easy to pursue an interest in science while continuing studies or holding a day job. Awareness about citizen science has grown sharply due to the development of technology.

If one were to ask why citizen science projects have become so popular off late, the answers would be many: interest in science, enjoyment, self-advancement, a sense of usefulness, etc. Many people are educated and talented but may not have the opportunity to put their science related education or talents to use. Citizen science projects provide intellectual challenge that many intelligent people long for.





Source:
https://commons.wikimedia.org/wiki/File:Sir_William_Herschel_and_Caroline_Herschel._Wellcome_V0002731.jpg

Citizen science in history: The phrase, "citizen science" entered the dictionary in 2014 but the idea of citizen science itself is centuries old. Some of the greatest scientists in the world worked independently to pursue questions that intrigued them.

William and Caroline Herschel were 18th century astronomy enthusiasts and siblings who were the first to spot Uranus and also discovered several comets. The European Space Agency[2] describes them as pioneers of systematic classification and investigation

2 https://www.esa.int/Science_Exploration/Space_Science/Herschel/Caroline_and_William_Herschel_Revealing_the_invisible

of the heavens. While William Herschel was one of the first 'professional' astronomers who discovered infrared radiation, Caroline Herschel helped William develop the modern mathematical approach to astronomy.

Mary Anning was an 18th century fossil collector, or what we may now call a palaeontologist. Anning's independent work and discoveries provided key links in reconstructing the history of life on Earth. Her findings were an immense contribution to palaeontology in its early days as a scientific discipline.

Source:
https://en.wikipedia.org/wiki/Mary_Anning#/media/File:Mary_Anning_painting.jpg

Source:
https://en.wikipedia.org/wiki/Anna_Atkins#/media/File:Anna_Atkins_1861.jpg

Anna Atkins is a 19th century English botanist who created cyanotypes – a method of creating images by placing objects directly onto light-sensitive paper. Using this method, Atkins captured the plants and algae she was studying in the form of beautiful silhouettes that provided a detailed and accurate representation of their form. This paved the way for scientific illustrations in academic books in later years.

Creating solutions for stakeholders: Citizen Science (CS) occurs when amateurs, science enthusiast, students or non-professionals group themselves to explore challenges in science and create solutions for the stakeholders. The people involved contribute with their scholarly inputs, understanding and resources. This approach to scientific discovery and research has become very popular in the last two decades with many challenges cropping up on all fronts. Citizen science projects come up when people enjoy the sheer pursuit of knowledge or decide to improve an already existing knowledge by joining forces with like-minded people. It involves a high level of evolved thinking to make a CS project fly. Flora watching, observing seasonal changes, fauna watching are popular citizen science projects as they require tremendous human inputs in terms of observations and recordings. Many scientific organisations also involve public participation in scientific projects. NASA has several citizen science projects going on. Outer space is so vast a subject, there is room for everybody to contribute. Data collection is an important part of scientific research and this is where citizen scientists come in extremely handy for scientists. Being in the field, they often provide many important leads in research which help scientists further their research.

A village home for migratory birds: A little digging around and research will show that community participation in nature conservation has been going on long before this idea of citizen science was floated. Nature conservation carried out in Kokrebellur, a small village in Mandya district of Karnataka is a good example of community involvement and citizen science much before the idea was formalised. Kokrebellur is not a reserved forest sanctuary but a small village where pelicans, painted storks – birds of near threatened category in the IUCN (International Union of Conservation of Nature) Red List come to roost for 4-5 months on the tamarind trees growing in the village.

The villagers and the migratory birds coexist in peace and harmony during this period. Soon the birds multiplied in numbers and this forced the government to step in and assist the villagers by compensating them for the tamarinds that were the food source for the birds and the space that was given to the birds to live peacefully. Later, many NGOs got involved to look after the fledglings that needed care.

National butterfly campaign: A citizen campaign is currently underway to identify a national butterfly with half a lakh people joining the movement. Spearheaded by researchers, scientists and enthusiasts, the campaign focuses on the role of butterflies in enriching the biodiversity of India where 1300 species belonging to six families are found. The organizers believe that the opinion of the people in the selection process will help to garner and support the interest about the cause among everyone.

Challenges of citizen science: Getting a citizen science project off the ground has its own challenges. Trust is an important aspect of such projects and acknowledgement of one's contribution is also important. Most scientific organisations shy away from involving public in the research process due to the organisational barriers as well as the unacknowledged sense of superiority that sometimes exists among scientific communities that leads some to consider themselves much above the common man. Thievery of intellectual capital is another issue that citizen scientists face when their work gets stolen by those who are more established in the field.

In a bid to help the nation secure its place as a knowledge-based society, the Department of Science and Technology, Government of India runs a National Innovation Foundation (NIF) to encourage creativity and innovation in all fields. They recognise grass root innovators and even help them with filing patents and design registrations for their inventions. The foundation also provides risk capital to innovation-based enterprise projects. There are many inspiring stories on the NIF website that will encourage citizen scientists to pursue their interest in scientific innovations and inventions.

Role of schools in citizen science: Today's world of crowdsourcing provides a great opportunity to schools to include citizen science in the classroom. Genetic testing, organic chemistry, etc., are some of the new areas where solutions are being crowdsourced. Real time data mapping services are also easily implemented with the help of technology and citizen scientists. Local problems that affect the immediate community can be addressed by a group of citizen scientists. Schools can easily guide students towards such projects and help

mould their future, as well make them a vibrant part of society. Not just that, it is a way for schools to play a role in democratising science – something that has been a longstanding demand of scientists who know the ins and outs of research funding and have probably seen many projects get entangled in the quagmire of politics and bureaucracy. Citizen science provides a ray of hope for such projects and is the proverbial silver lining that will break through the clouds of officialdom in science research.

Sujata C is a writer and editor with more than thirty years of experience. She writes on children, food, environment, society, as well as technology. She has also been a copywriter with advertising agencies for over fifteen years.

Lesson Plan: Introducing citizen science in the classroom

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Getting students interested in citizen science is a great way to help them identify their likes and future growth plans. Here are some simple ways to introduce them to the concept of citizen science and how to go about it.

1. Encourage them to find out names of citizen scientists who made significant discoveries/inventions in recent times.
2. Bird conservation: Ask your class to prepare a project report on Kokrebellur detailing the role of volunteers in this unique natural bird conservation work.
3. Vulture conservation: Help students find out how vulture restaurants or feeding sites came up. Plot some of the vulture restaurants in India on a map.
4. Explore some of the sites listed below with your students and encourage them to become a participant in those that interest them:
   - Season watch: https://www.seasonwatch.in/
   - Flora watch: efloraofindia
   - Migrant watch to study birds: http://www.migrantwatch.in/
   - Space watch/Planet hunt: NASA's citizen science projects have helped make several discoveries. https://science.nasa.gov/citizenscience
   - Zooniverse: https://www.zooniverse.org/

5. Reef watching, or road kills tracking have become popular citizen science topics lately. Ask your class to find out the trending citizen science topics.


6. Create a group and assign them to make “I am a citizen scientist” poster for display in class.
7. Engage the entire class to make a report on the National Butterfly Campaign.
8. Explain how urban flooding spotlights the importance of lake conservation and plan a project on the topic.

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Sodality (noun)

Pronunciation: /səʊˈdalɪti/

Meaning: A confraternity or association, especially a Roman Catholic religious guild or brotherhood.

Origin and additional information: The word originated in the early 17th century from French “sodalité” or Latin “sodalitas” meaning sodalis or ‘comrade/companion’. Sodality is also known as “syndiakonia” in Christian theology denoting a form of the universal church. In English, the term *sodality* is commonly used by different groups including the Anglican Communion, Catholic Church, Eastern Orthodox Church, Lutheran Church and Reformed Church, who also refer to the term as “confraternities”. Sodalities became universally known since the advent of the modern missionary movement, commonly attributed to William Carey from the 1790s.

Word section: Unlike the more common Christian denomination “modalities”, sodalities are usually considered as parachurch organizations which include missionary organizations and Christian fraternities not necessary linked to any church. However, they uphold the Christian virtue of charity, a bond of unity that brings together the most distant sections of the Christian Church by the interchange of mercy. With the passage of time, what started off as a rudimentary beginning became a largescale activity of the church resulting in different classes of sodalities, each defined by their relation or association with the church.

Usage:

1. *In the 'good old days', all one needed to get a crowd out on the streets on a religious holiday was a call to the head of the men's and ladies' sodalities.*

   (Source: https://www.lexico.com/definition/sodality)

2. *By 1965 the sodalities were clearly on the wane, a fact which in the opinion of the bishop and the prior was largely due to the advent of television.*

   (Source: https://www.lexico.com/definition/sodality)

3. *A tragic loss of life that was felt throughout the sodality of firefighters.*

   (Source: https://www.merriam-webster.com/thesaurus/sodality)