

Citizen Science & Science Capital

A TOOL FOR PRACTITIONERS



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These materials are aimed at practitioners of citizen science who are considering ways to enhance participation and learning in citizen science projects. This emerging work is a collaborative effort among several institutions seeking to integrate elements of science capital and learning research into the practice of citizen science.

In family and community cultures where there is the greatest science capital, there is broader engagement with science.

This encourages positive attitudes and habits towards participation and learning from scientific activities, such as citizen science, and the further growth of science capital. Conversely, those family and community cultures with low science capital tend not to engage with science and science-related activities and receive negative feedback that science 'is not for them'. As a result, their science capital does not grow.

Here we present some materials to support reflection upon incorporating science capital into citizen science practice. We include a number of tools or activities that may help you to better understand the relatively new concept of science capital, and its relevance to the field of citizen science. The activities can be used on an individual basis or in groups.

1 What is Science Capital?

Science capital is part of the cultural and social resources that individuals and groups acquire from their family and social relationships and participation in scientific-related activities, such as viewing science-related media, conducting school lab exercises, or engaging in citizen science projects. Science capital can enhance people's capacities to participate in scientific learning, education, leisure activities, and careers.

Science capital is related to cultural and social capital. Cultural capital refers to resources such as educational qualifications, cultural goods, etiquette, and the attitudes and habits that people gain from them. Social capital refers to resources such as social networks and relations, including extended family relationships. Social and cultural capital affects our habits and preferences at home and in our communities and workplaces.

Science capital refers to aspects of cultural and social capital that have a specific scientific focus, or which affect how much people get involved in science activities and events. The idea of science capital emphasizes the importance of family and social group cultures and relations, rather than individual motivations towards science.

The Enterprising Science project, which has been working with schools in the UK, has identified a number of dimensions of science capital influencing young people's attitudes towards science (see Further Reading for more details). These dimensions, which we have adapted for a potential wider age range, are:

- *scientific literacy, for example, engagement with and understanding of scientific questions and issues*
- *scientific-related values, for example, a commitment to evaluation of evidence to support actions*
- *knowledge about transferability of science in the labour market*
- *consumption of science-related media*
- *participation in informal science learning contexts*
- *knowing people who work in science-related jobs*
- *talking to others about science outside formal educational environments, for example, in social situations*

These dimensions can be used to explain existing patterns of participation and learning in science. They also can be used to help design citizen science projects to maximise the benefits received by participants and develop measures of impact.

ACTIVITY

Reflecting on your own experience in relation to the dimensions, explore and evaluate your own levels of science capital. Are there some dimensions where you are higher than others?

Why is that?

	LOW	MEDIUM	HIGH
Scientific literacy			
Scientific-related values			
Knowledge about transferability of science in the labour market			
Consumption of science-related media			
Participation in informal science learning contexts			
Knowing people who work in science-related jobs			
Parental science qualification			
Talking to others about science outside formal educational contexts			

2 Why is Science Capital Important?

Science capital has been identified as an important way of explaining individuals' participation in science learning, education, leisure activities, and careers. Science capital also can be used to design experiences to encourage participation in and learning from science.

For example, the distribution of science capital resources might account for the unequal participation in science in society. Enhancing science capital resources for a group of people could potentially change their attitudes and habits to enable more participation in and learning from science.

Understanding scientific social networks and relations is integral to enhancing science capital. Consider three types of science capital relationships:

- **Bonding science capital** refers to the ties between people in similar situations, such as immediate family, close friends, and neighbours.
- **Bridging science capital** refers to the more distant ties of familiar persons, such as loose connections with friends, peers, and workmates.
- **Linking science capital** refers to attempts to reach out to unfamiliar people in different situations, enabling them to access and make use of a wider range of resources than are available within their existing culture or community.

In seeking to extend participation in citizen science, we might look at the ways in which bonding, bridging, and linking science capital are part of current practice and the potential for a greater focus on developing linking science capital.

ACTIVITY

Consider the forms of bonding, bridging, and linking science capital within a citizen science project that you are familiar with and fill out the table below.

DIMENSIONS	What opportunities for the development of (bonding, bridging and linking) science capital already exist in your program?	What recruitment, support, and learning opportunities could enhance the development of (bonding, bridging and linking) science capital in your program?
Scientific literacy		
Scientific-related values		
Knowledge about transferability of science in the labour market		
Consumption of science-related media		
Participation in informal science learning contexts		
Knowing people who work in science-related jobs		
Parental science qualification		
Talking to others about science outside formal educational contexts		

Drawing from your answers in the table above, how might we turn linking science capital into bonding science capital within the work of citizen science in order to increase the participation of some individuals and groups?

3 What Does the Evidence on Science Capital Tell Us?

Influential research on science capital can be found in the ASPIRES and Enterprising Science projects in England and Wales (see Further Reading for more details).

The ASPIRES project was a longitudinal study focussed on aspirations towards science and science careers among 10 to 14 year olds. While the young people who were studied showed consistently high aspirations in relation to their education across the time span, and while they recognised the importance of science and school science, only 15% aspired to become a scientist.

Families were identified as very influential to the attitudes and behaviours of young people. The children of families with the most scientific capital (e.g., families whose adults had scientific qualifications and scientists in their social networks) were more likely to consider a scientific career.

Parental attitudes and the encouragement of science in everyday family life, such as leisure activities, television, books, topics of conversation, and social networks, also influenced young people's aspirations.

In other words, in family and community cultures where there is the greatest science capital, there is broader engagement with science. This encourages positive attitudes and habits towards participation and learning from scientific activities, such as citizen science, and is a positive feedback loop with those people further enhancing their science capital through participation in such activities. Conversely, those family and community cultures with low science capital tend not to engage with science and science-related activities and receive negative feedback that science 'is not for them'. As a result, their science capital does not grow.

ACTIVITY

Drawing upon a citizen science project that you are familiar with, how might you leverage family and social relationships to enhance the wider participation of families or groups within the project?

4 What Are the Implications of Science Capital for Citizen Science Practitioners?

Understanding science capital can help citizen science practitioners in two ways:

1. In relation to the recruitment of participants. Understanding science capital can help you to understand why certain people take part in your projects and why others do not. Even if a project is theoretically open to all, only certain people (i.e. those with higher science capital) are likely to choose to take part and participate over time.

This can help you to design recruitment strategies to reach beyond the 'usual suspects', for example, by delivering your project through schools in areas of high deprivation, or by targeting non-science community groups to encourage people with lower science capital to participate.

2. In relation to increasing the science capital of participants once they are within the project. You can design the activities within your citizen science project to enhance the science capital of people who take part, for example, by enabling them to meet - in real life or virtually - people who work in science, by showcasing the relevance of science to a range of careers, or by developing or linking to science-related media.

By drawing upon the dimensions of science capital in designing citizen science projects, we can make participation in and learning science more realistic within a wider range of family and community cultures.

ACTIVITY

Consider the dimensions of science capital and forms of bonding, bridging, and linking science capital in a citizen science project that you are familiar with. Map some specific proposals for actions that could enhance science capital.



Further Reading

Science capital

Archer, L., DeWitt, J., Osborne, J., Dillon, J., Willis, B. and Wong, B. 2012. Science aspirations, capital, and family habitus: How families shape children's engagement and identification with science. *American Educational Research Journal* 49 (5): 881-908.

Archer, L., DeWitt, J. and Wong, B. 2014. Spheres of influence: What shapes young people's aspirations at age 12/13 and what are the implications for education policy? *Journal of Education Policy* 29 (1): 58-85.

Archer, L., Dawson, E., DeWitt, J., Seakins, A. and Wong, B. 2015. 'Science capital': A conceptual, methodological, and empirical argument for extending Bourdieusian notions of capital beyond the arts. *Journal of Research in Science Teaching*. DOI10.1002/tea.21227

Social and cultural capital

Bourdieu, P. 1983. Forms of capital. In J. C. Richards (ed.). *Handbook of Theory and Research for the Sociology of Education*, New York: Greenwood Press.

Coleman, J. C. 1988. Social capital in the creation of human capital. *American Journal of Sociology* 94: S95-S120.

Field, J. 2003. *Social Capital*, London: Routledge.

Putnam, R. D. 1995. Bowling alone: America's declining social capital. *Journal of Democracy* 6 (1): 65-78.

Putnam, R. D. 2000. *Bowling Alone. The Collapse and Revival of American Community*, New York: Simon and Schuster.

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