Team Science, Justice, and the Co-Production of Knowledge

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Abstract  Science increasingly consists of interdisciplinary team-based research to address complex social, biomedical, public health, and global challenges through a practice known as team science. In this article, I discuss the added value of team science, including participatory team science, for generating scientific knowledge. Participatory team science involves the inclusion of public stakeholders on science teams as co-producers of knowledge. I also discuss how constructivism offers a common philosophical foundation for both community psychology and team science, and how this foundation aligns well with contemporary developments in science that emphasize the co-production of knowledge. I conclude with a discussion of how the co-production of knowledge in team science can promote justice.

Keywords  Interdisciplinary  ·  Team science  ·  Participatory  ·  Heterarchy  ·  Mode 2 science  ·  Perspectivism

Introduction

The traditional way of doing science is no longer sufficient to address complex social, biomedical, public health, and global challenges. Poverty, addiction, cancer, climate change, income inequality, wellness promotion, food insecurity, and health disparities are among the many challenges that require solutions from more than one discipline and perspective. Increasingly, science involves conducting interdisciplinary team-based research to address such challenges, a practice known as team science (National Research Council [NRC], 2015).

Interdisciplinary team science can be defined as a collaboration in which researchers from different disciplinary traditions work interdependently to develop a shared understanding of a problem and then mix constructs, tools, methods, or approaches from their respective disciplines to solve it (Bozeman & Boardman, 2014; NRC, 2015; Stokols, Misra, Moser, Hall, & Taylor, 2008). What distinguishes team science from other research collaborations is the blending of perspectives across disciplines (or specialties) to study a scientific problem in a new way.1

Team science contrasts with unidisciplinary or multidisciplinary research; the former draws on a single discipline, while the latter on multiple disciplines but includes limited blending of models, methods, and approaches (Rosenfield, 1992). Transdisciplinary research and transdisciplinary team science are more recent terms to describe the combining of interdisciplinary perspectives into a hybrid discipline (Abrams, 2006; Hall et al., 2012; Rosenfield, 1992; Stokols, 2006). Bioengineering, neuroscience, gender studies, science and technology studies, and sustainability science are examples of hybrid disciplines that emerged from blending two or more disciplines (Tebes & Thai, 2018). Interdisciplinary and transdisciplinary research are often used interchangeably, even though the latter is mostly

1 Due to the increased specialization of disciplines (Leahey, 2016), team science can also involve interspecialty collaborations that blend expertise across specialties within a given discipline.
aspirational because the research collaboration rarely results in a new hybrid discipline (Tebes, Thai, & Matlin, 2014).

There is considerable empirical evidence that shows a decades-long trend toward team-based interdisciplinary research (Bozeman & Boardman, 2014; Henriksen, 2016; Leahey, 2016; National Research Council [NRC], 2015; National Science Foundation [NSF], 2005). Since the 1960s, team-authored publications have increased in the natural sciences, engineering, and the social sciences, even as the rate of team-authored publications in the arts and humanities has remained flat (Wuchty, Jones, & Uzzi, 2007). During this period, team-authored publications were cited more frequently and published in higher impact journals than single-authored publications (Wuchty et al., 2007). Also, although research funding overwhelmingly favors individually supported, investigator-initiated research (Bromham, Dinnage, & Hua, 2016), in recent decades there has been increased funding for team-based research and team science (Collins, Wilder, & Zerhouni, 2014; National Institutes of Health [NIH], 2006a; NIH, 2006b; NSF, 2005; Zerhouni, 2003, 2007).

Recently, my colleague Nghi Thai and I introduced the term participatory team science to refer to an interdisciplinary science team that incorporates public stakeholders as co-producers of knowledge (Tebes & Thai, 2018). In participatory team science, the work of the team is both interdisciplinary and participatory, such that interactions among team members not only bridge disciplinary boundaries among scientists, but also navigate differing worldviews between scientists and the public. We argue that participatory team science should be the “default” practice for team science because public stakeholders may have local, culturally situated, and contextualized knowledge about problems under study that is not otherwise available to a science team. This does not mean that the public must be partners on all teams or during all phases of a science team—development, conceptualization, implementation, translation (Hall et al., 2012)—but rather, that inclusion of public stakeholders be explicitly considered during each phase for its potential added scientific value. Participatory team science, thus, differs from the ideals of community-based participatory research (CBPR; Israel, Schulz, Parker, & Becker, 1998; Minkler & Wallerstein, 2011) in which public stakeholders are engaged throughout the research process. What it has in common with CBPR and other participatory approaches is that equity among research collaborators is a guiding principle, power is shared, and collaborators are valued for their individual perspective and expertise in contributing to the research.

In this article, I discuss the added value of interdisciplinary team science to knowledge production, and then describe the relationship of team science to community psychology. Next, I discuss how both community psychology and team science have a common philosophical foundation in constructivism, and how this aligns with contemporary developments in science that emphasize the co-production of knowledge. I then conclude by discussing how the co-production of knowledge in team science promotes justice for public stakeholders, and thus aligns with core principles of community psychology.

The Added Value of Interdisciplinary Team Science

Integral to the performance of interdisciplinary science teams are social interactions among team members to carry out the research (Salas, Fiore, & Letsky, 2013). Effective social interactions are essential for developing a shared mental model of the problem to be addressed, communicating about that problem, establishing roles and responsibilities for team members to address it, and facilitating cooperation to achieve team goals (Salas, Shuffler, Thayer, Bedwell, & Lazzara, 2015; Salas et al., 2013). In science teams, effective social interactions also result in the development of a transactive memory system in which team members know who has credible specialized knowledge to carry out specific tasks and how to access and communicate that knowledge (Zajac, Gregory, Bedwell, Kramer, & Salas, 2014). Successful teams have a robust transactive memory for accomplishing proximal and distal goals and making changes in response to emerging issues.

Successful teams are also likely to have an enhanced integrative capacity that enables individual members and the team to assimilate new knowledge (Salas et al., 2013; Salazar, Lant, Fiore, & Salas, 2012). For interdisciplinary science teams, knowledge integration is the goal of the research collaboration (National Research Council [NRC],
Bozeman & colleagues (Bozeman & Boardman, 2014; Bozeman, Dietz, & Gaughan, 2001) use the term scientific and technical human capital, or STHC, to describe the added value of team-based research. STHC refers to each team member’s specialized knowledge and expertise, education and training, institutional resources, professional and social networks, disciplinary perspective, and scholarly community that ultimately contribute to the work of the team (Bozeman & Boardman, 2014).

When an interdisciplinary science team includes public stakeholders, there is an additional benefit because the public may have local, culturally situated, and contextualized knowledge about a complex problem that scientists do not have (Tebes & Thai, 2018; Tebes, Thai, et al., 2014). This may expand the range of what can be studied and how to study it. Further, including local members of a community in the development of community-level interventions may ensure that culturally embedded and contextualized knowledge is incorporated into the research (Israel et al., 1998; Jason et al., 2004; Trickett, Beehler, Deutsch, & Trimble, 2011). Importantly, the potential benefit of research engagement with public stakeholders is also increasingly evident to basic scientists studying cancer (DelNero & McGregor, 2017; Sellers, Caporaso, Lapidus, Petersen, & Trent, 2006), gene drive systems (National Academies of Sciences, Engineering, & Medicine [NASEM], 2016), and the environment (Bonney et al., 2014).

To illustrate the value of how public stakeholders may inform the research, my colleague Nghi Thai and I (Tebes & Thai, 2018) use a hypothetical example of a participatory science team studying the impact of adverse childhood experiences (ACEs; e.g., child maltreatment, living in poverty, parental addiction) and neighborhood disadvantage (e.g., exposure to neighborhood violence; exposure to neighborhood disorder and decay) on the health and well-being of children and families. Investigators from psychology, sociology, neuroscience, and economics decide to form an interdisciplinary team to study this issue, and invite local public stakeholders onto the team: a neighborhood coalition representative, a parent representative from a local school, a policymaker from the mayor’s office, a neighborhood healthcare provider, and a local urban planner. These stakeholders—and their affiliated networks—participate in conceptualizing, developing, implementing, and translating the research during various research phases. For example, the parent and coalition member help develop the mental model to guide the research. The policymaker assists with navigating implementation challenges. The healthcare provider supports data collection in the provider network. And the parent representative and urban planner participate in disseminating results to community and professional audiences. In this example, each public stakeholder is embedded in an affiliated network that has contextualized and culturally situated knowledge to enhance the team’s integrative capacity, and ultimately, its knowledge integration.

This example was developed by two community psychologists that shows the value of engaging public stakeholders as equal partners in research. There are many others from our field. Kelly (1988) shows the benefits of attending to local diverse perspectives when partnering with community members. Jason et al. (2004) describe how participatory methods in community settings can enhance effective systemic change. Miller and Shinn (2005) describe the importance of incorporating community capacity and community values in the implementation and dissemination of programs. Rapkin and colleagues (Rapkin & Trickett, 2005; Rapkin et al., 2017) illustrate how a certain design implemented in partnership with community members can serve as an alternative to a randomized controlled trial (RCT). Maton, Perkins, and Saegeert (2006) and Stokols (2006) describe the value of partnered transdisciplinary research for empirically founded social action. And Trickett and colleagues (Trickett & Schensul, 2009; Trickett et al., 2011) make a compelling case for how the multi-level, community-based, and culturally situated interventions can make interventions more relevant to stakeholders and, ultimately, more sustainable.

The value of interdisciplinary team science for knowledge production, thus, comes from several sources (Tebes & Thai, 2018; Tebes, Thai, et al., 2014). First, it includes the direct impact of blending diverse perspectives, models, methods, and approaches to study a problem that has been defined in a new way. Second, it includes the indirect, and potentially more far-reaching impact, of engaging the networks and institutions tied to disciplinary scholars and public stakeholders (e.g., individuals with lived experience of the problem, government, business and industry, service sectors). And finally, it includes new and sustained investments by scholars and the public in solving real-world problems based on the research.

**Team Science and Community Psychology**

Team science, and especially, participatory team science, is consistent with several core principles of community psychology, including advancing participatory action, understanding human diversity and cultural contexts, developing empirically based models for action, and promoting theoretical and methodological pluralism (Tebes, 2017; Tebes, Thai, et al., 2014). As noted above, since its inception, community psychology has been at the forefront of participatory
collaborations with diverse public stakeholders in research or action and in pioneering a pluralism of methods and theories to promote well-being and affect social change (Jason et al., 2004; Kelly, 1988; Tebes & Kraemer, 1991; Tolan, Keys, Chertok, & Jason, 1990; Trickett & Schensul, 2009). These efforts are aligned with other participatory approaches, such as CBPR, and reflect a central commitment to collaboration, co-learning, integration of diverse perspectives, and shared ownership of the work and its products (Israel et al., 1998; Jason et al., 2004; Kelly, 1988; Minkler & Wallerstein, 2011).

Community psychology and team science, like participatory approaches, more generally share philosophical roots in constructivism. Modern constructivism, which is central to the philosophy of pragmatism developed by Dewey, asserts that knowledge is the by-product of our experience of, and transactions in, the world (Dewey, 1905, 1925). For Dewey, our knowledge is uniquely “situated” in the world, and we construct knowledge through our interactions with it (Biesta, 2010). Elsewhere (Tebes, 2012, 2017), I have described how Dewey’s concept of situated knowing through action is aligned with later feminist theories of knowledge (Haraway, 1988; Harding, 1986; Longino, 1990) and with critical theory (Bohman, 2002), both of which, along with pragmatism and perspectivism (which I discuss below), offer a philosophical foundation for community psychology (Tebes, 2017). Constructivism is also central to contemporary critiques of logical empiricism⁴ as the basis for science (Gergen, 1985; McGuire, 1989; Tebes, 2005, 2012, 2017; Trickett, 2009). For example, Kuhn’s (1962/1970) influential critique of logical empiricism argued that, contrary to accepted belief at the time, science did not (mostly) progress rationally toward the truth. Rather, he showed that since science consists of the actions of scientists, it is inextricably bound by their social interactions, cultural beliefs, and the norms of their scientific community. Subsequent scholars, such as Longino (1990, 2013) and Harding (1986) extended Kuhn’s work to consider how the social dimensions of scientific knowledge and the social activity of scientists influence what is even considered to be “science”. Further, working within a constructivist framework, Giere (2006) showed that understanding of the physical sciences depends on a living (human) observer, and is thus perspectival. He has called this philosophy of science perspectivism. McGuire has discussed perspectivism’s relevance to the behavioral sciences (McGuire, 1989) and social psychology (McGuire, 2004), and my colleagues and I have discussed it in relation to program evaluation and mixed methods research (Tebes, 2012; Tebes, Kaufman, Connell, Crusto, & Thai, 2014) as well as community psychology (Tebes, 2017; Tebes, Thai, et al., 2014).

Team science and community psychology, thus, each share a belief that knowledge is constructed and co-produced through collaborative social interactions (Tebes, 2017), a belief that is consistent with contemporary changes in science (Gibbons et al., 1994; Jasanoff, 2004).

**Contemporary Science and the Co-Production of Knowledge**

Over the past several decades, team science has grown amidst other changes in how science is understood and practiced (Tebes, Kaufman, et al., 2014). Nowotny, Gibbons, and their colleagues have described these changes as a tension between Mode 1 and Mode 2 knowledge production in science (Gibbons et al., 1994; Nowotny, Scott, & Gibbons, 2003a,b). Nowotny et al. (2003b) describe Mode 1 science as the “old paradigm” of knowledge production that is discipline-based and primarily focused on conducting experiments to test theories. In this paradigm, scientists operate autonomously and are accountable mostly to the funding agency and their university or institution. In contrast, they describe Mode 2 science as a “new paradigm for knowledge production...(that is) socially distributed, application-oriented, transdisciplinary, and subject to multiple accountabilities” (p. 179) that are embedded in specific contexts (social, political, economic).

Table 1 shows a comparison of Mode 1 and Mode 2 knowledge production in science. As shown, Mode 1 depicts the traditional way of conceptualizing and conducting science. The research is theory-driven rather than application-oriented, and research methods prioritize internal validity over external validity in study design (Tebes, 2000). Mode 1 science also seeks to identify universal theories with broad application across contexts and to emphasize conducting experiments. In Mode 2, scientific questions are framed within local contexts and cultures, and examined using multiple and mixed methods. In Mode 1, research is primarily discipline-based, whereas in Mode 2 it is more likely to be interdisciplinary or transdisciplinary.

In Mode 1, the scientist seeks autonomy and conducts the research primarily through an institution, such as a university. In Mode 2, the scientist values an interdisciplinary research environment in which control is socially distributed among members of a team, and there are multiple accountabilities that may also include public
stakeholders and institutions alongside a university. In Mode 1, the research team is organized as a hierarchy, and knowledge production is directed by a Principal Investigator (PI) responsible for the research. In Mode 2, the research may be organized as a heterarchy\(^5\) that involves multiple Co-PIs responsible to each other for one or more aspects of the research, and knowledge is co-produced with multiple stakeholders.

To some extent, my description of Mode 1 and Mode 2 science is a caricature; the subtext being that Mode 1 is outdated, rigid, and elitist, whereas Mode 2 is modern, flexible, and inclusive. This depiction may be familiar to community psychologists, as we have been among those who have critiqued traditional science for overemphasizing certain research approaches (e.g., hypothesis-testing, nomothetic designs, RCTs, valuing quantitative over qualitative data) that can decontextualize knowledge from local and cultural contexts (Allen & Mohatt, 2014; Shinn & Toohey, 2003; Tebes, 2005; Trickett & Espino, 2004; Trickett & Schensul, 2009).

And yet, any fair-minded critic of Mode 1 science would be hard-pressed not to acknowledge that the “old paradigm” has generated extraordinary discoveries to promote health and eradicate disease, extend the human life span, and pioneer intellectual, technological, agricultural, social, and artistic achievements that have greatly benefited the world. That same critic, however, might also note that traditional science can limit knowledge production and constrain innovation because of the relatively narrow epistemological and methodological terrain its explores (Bradbury and Reason, 2011; Knorr Cetina, 1999; Teo, 2015). That is why many contemporary researchers, especially in the social and behavioral sciences, operate in two worlds, living a both/and existence that straddles Mode 1 and Mode 2 knowledge production in science (Tebes, Thai, et al., 2014). They may accept the verdicts of scientific peer review; espouse scientific norms that value objectivity, theoretical specificity, and traditional methodological rigor; and seek to identify constructs that—although not universal—are relevant across persons, settings, and times. However, these same researchers also may acknowledge the benefits of public-academic partnerships, value indigenous and feminist epistemologies, seek out interdisciplinary collaboration, and incorporate the use of mixed methods, perhaps even embedded in an RCT, to generate new knowledge.

Increasingly, governments, industry, and universities are creating structures that incentivize this “new paradigm” for science, thus encouraging a both/and reality for biomedical, social, and behavioral science researchers (Tebes & Thai, 2018). For example, public engagement in science is now a national priority for the United States, the European Union, and other countries. In the United States, one example is the Patient-Centered Outcomes Research Institute (PCORI), a quasi-governmental body that prioritizes, funds, and facilitates public engagement in health-related research (PCORI, 2013). In Europe, the “Science with and for Society” program of the European Union supports a variety of initiatives to engage the public in research (European Commission, 2013). Health Canada (2000), which is the governmental body charged with Canada’s health, encourages citizen participation in decision-making about health and related research. And in Great Britain, INVOLVE (2012) is a national advisory group within the National Institute for Health Research that offers a variety of tools and resources to encourage public engagement in research. In addition, each of these national initiatives encourages public–private investment in science to varying degrees, such as the Horizon 2020 program of the European Union, which actively seeks research partnerships with industry in priority areas (European Commission, 2013). Finally, in recent decades, universities across the world are establishing interdisciplinary research centers, promoting interdisciplinary on campus, and changing faculty incentive structures to reward interdisciplinary collaboration (Jacobs, 2013; Klein, 2010; National Research Council [NRC], 2015).

These developments show how common it now is to think of scientific innovation and discovery as a collaborative process at multiple levels—researchers, government, industry, public stakeholders (Bozeman & Boardman, 2014; Nowotny et al., 2003a; National Research Council [NRC], 2015). Also, collaboration involves a participatory approach that values diverse perspectives and is focused

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5 Tebes and Thai (2018) define a heterarchy as “a complex adaptive system of interconnected, overlapping, and dynamic components that govern constituent interdependent and networked components (Tebes, 2012; Tebes, Thai, et al., 2014).” Wikipedia, tech start-ups, and communities are organized heterarchically, in part, to accomplish shared goals.
on the co-production of knowledge (Jasanoff, 2004). I now discuss the implications of this for justice.

**Justice and the Co-Production of Knowledge**

Justice, and particularly social justice, has long been a central value (Kloos et al., 2012; Prilleltensky, 2001; Rappaport, 1977) and core principle (Tebes, 2017) of community psychology. I define social justice as the fair and equitable distribution of resources, opportunities, benefits, and obligations among individuals in a society (Prilleltensky, 2001; Torres-Harding, Siets, & Olson, 2012). In community psychology, one emphasis has been ensuring the fair allocation of goods and benefits to vulnerable and oppressed social groups, including enhancing participation and voice in decision-making about rights and obligations (Fondacaro & Weinberg, 2002; Prilleltensky, 2001; Torres-Harding et al., 2012).

More recent community psychology conceptualizations of justice have drawn on the distinction between the concepts of justice developed by John Rawls and Amartya Sen (Munger, MacLeod, & Loomis, 2016; Shinn, 2015). Rawls (1971), who developed a comprehensive contemporary conceptualization of justice, emphasized the equitable distribution of goods and benefits to individuals through the social contract we have to one another in a civil society. Sen (2009) extended the Rawlsian concept of justice to include personal agency, such that justice includes the freedom for each person to live the life they choose. Nussbaum (2000) has extended Sen’s conceptualization of justice further by emphasizing the importance of giving individuals the freedom to realize their capabilities to promote their well-being. Both Shinn (2015) and Munger et al. (2016) describe how the capabilities approach to justice advanced by Sen/Nussbaum aligns well with community psychology values, such as the promotion of well-being and advancing participatory action.

**Incentivizing Team Science as Public Policy**

Earlier I described how participatory team science incorporates local, culturally situated, and contextualized knowledge on a science team. This provides STHC that can enhance the team’s integrative capacity and ultimately its knowledge integration. However, what are the implications of this for justice?

Aristotle was among the first to describe justice as having both “particular” and “universal” qualities (Miller, 2017). As a particular quality, justice seeks to ensure that an individual is treated fairly and receives an equitable distribution of goods and benefits depending on the circumstance. However, justice as a universal quality seeks to ensure that all individuals or groups of individuals receive a fair distribution of goods and benefits. Here, I focus on justice in its universal application; in modern form, this includes justice as equity in public policy.

Justice as equitable public policy represents an obligation by the state to ensure the fair distribution of a public good or benefit (Miller, 2017; Sandler, 2009). In relation to team science, one might argue that the state’s obligation is only to scientists, given their track record over the past century in conducting research that benefits humanity. Scientists have specialized knowledge, expertise, and training and are embedded in scholarly communities that generate new knowledge. Thus, one might rightly argue that justice is served if scientists have special privileges, including resources, to generate knowledge that could benefit society.

In recent decades, the benefits afforded to individual scientists have been extended to interdisciplinary science teams (Collins et al., 2014; Zerhouni, 2003, 2007) because of the added value of team science in generating knowledge that has a greater impact (National Research Council [NRC], 2015; Wuchty et al., 2007). However, several years ago, scientists seeking to assemble an interdisciplinary science team were confronted with a fundamental structural inequity that mitigated their involvement in team science. Co-equal collaborating scientists on a science team incurred a penalty for engaging in team-based research since there was no mechanism to credit each scientist as a PI. To remedy this, the NIH developed the Co-PI structure for NIH-funded research (NIH, 2006a). This structure ensured that investigators would each receive equal credit for team-based research and incentivized interdisciplinary team science. Co-PIs would now each be accountable for specific aspects of the research, thus making the system fairer for scientists while also institutionalizing incentives for interdisciplinary team science.

As public policy, the Co-PI structure offers an example of public policy that prioritizes justice while also advancing team science. With the increasing recognition of the potential benefits of public engagement in science (Boney et al., 2014; Stilgoe, Lock, & Wilsdon, 2014), we are now at a similar crossroads for participatory team science (Tebes & Thai, 2018). However, the current landscape of team science reveals an abiding injustice that, despite the lack of local, culturally situated, and contextualized knowledge available to science teams, is not addressed through public policy that incentivizes public participation on science teams (Tebes & Thai, 2018). The earlier example of ACEs and neighborhood disadvantage illustrates the potential value of public stakeholder participation, but there are many other examples. Schulz and Mullings (2006) show numerous instances of how participatory approaches focused on health can reveal intersectionalities (Crenshaw, 1991; Rosenthal, 2016) of interlocking
systems of oppression based on gender, race, ethnicity, social class, and other social identities; these may be lost to a science team without public stakeholder participation. Magruder et al. (2016) describe how much of the research on trauma-informed practice has not incorporated the voices of trauma survivors, to the detriment of both science and practice. Wells, Jones, Chung, and Ramos (2013) show how some mechanisms underlying health disparities become evident when the public is meaningfully engaged in the research. And Rasmus, Charles, and Mohatt (2014) reveal how the perspectives of indigenous peoples are not incorporated in the construction of measures of health outcome, thus resulting in a disconnect between the lived experience of indigenous peoples and how health-related interventions are evaluated.

Whether the research involves addressing the sequelae of ACEs and neighborhood disadvantage, intersectional systems of oppression, coping with trauma, addressing health disparities, or giving voice to indigenous peoples, science teams that ignore the public as valued participants in the co-production of knowledge commit an injustice. When the state allows that injustice to persist, it withholds a public benefit—opportunities for knowledge co-production—and thus, does the public harm, today and in the future.

National initiatives that incentivize participatory team science offer a remedy for this injustice. Incentivizing public participation on science teams during each phase of the research process, even for basic science research, would bring diverse perspectives into the knowledge co-production process, thus both enhancing the science and creating an opportunity for promoting justice. The result may be messy (Israel et al., 1998; Nowotny, 2016; Stilgoe et al., 2014), fraught with competing agendas (Black et al., 2013; Burke et al., 2013), and involve power imbalances not only among scientists (Frickel, Albert, & Prainsack, 2016) but between scientists and the public (Shepard et al., 2013; Trickett et al., 2011). However, engaging these challenges has enormous potential benefit for generating new knowledge to solve real-world problems (Kost, Leinberger-Jabari, & Tobin, 2017; Tebes & Thai, 2018).

So how can justice be served through participatory team science? In two ways: First, by enhancing equity in offering the public opportunities for participation and voice in how research is conceptualized, developed, implemented, and translated. And second, by creating opportunities for the public to realize individual capabilities as co-producers of scientific knowledge.

Conclusion

In this article, I began by discussing the added value of interdisciplinary team science for generating knowledge, and then described the unique contribution of public stakeholder involvement on science teams through participatory team science. Next, I discussed how constructivism offers a common philosophical foundation for community psychology and team science, and how that foundation aligns well with contemporary developments in science that emphasize the co-production of knowledge. Finally, I concluded with a discussion of how the co-production of knowledge in team science can promote justice.

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