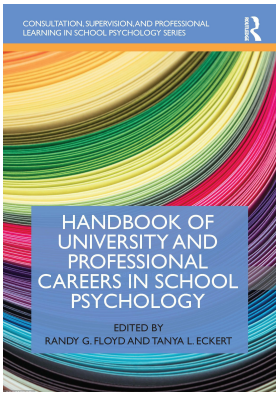

Handbook of University and Professional Careers in School Psychology

Randy G. Floyd, Tanya L. Eckert

Making the Most of Collaborative Research Projects

Publication details
https://www.routledgehandbooks.com/doi/10.4324/9780429330964-27
Sandra M. Chafouleas, Lisa M. Hagermoser Sanetti, Beth S. Russell
Published online on: 30 Dec 2020

18 Making the Most of Collaborative Research Projects

Sandra M. Chafouleas, Lisa M. Hagermoser Sanetti, and Beth S. Russell

> Even if a team is made up of experts, it can still fail if they do not know how to cooperate, coordinate, and communicate well together.
>
> (Salas, Reyes, and McDaniel 2018, p. 593)

If you are like us, you begin a collaborative project full of excitement and anticipation that the endeavor will result in positive outcomes that you could not envision accomplishing alone. After all, the defining feature of collaboration is the act of working with more than one person toward a common goal—with the expectation that "more than one'" means greater productivity and efficiency. Although many collaborations do result in positive outcomes, the process from beginning to end is typically not linear and can be full of unanticipated challenges, such as difficult interpersonal interactions, missed timelines, and changed task responsibility. The opening quote serves to set the stage for the purpose of this chapter, which is to provide an overview of the science behind teams and to offer recommendations to facilitate strong collaborative education research projects.

To begin, we provide the following definition of work teams (as opposed to, for example sports teams), offered by Kozlowski and Ilgen (2006):

> (a) two or more individuals who; (b) social interact (face-to-face or, increasingly, virtually); (c) possess one or more common goals; (d) are brought together to perform organizationally relevant tasks; (e) exhibit interdependencies with respect to workflow, goals, and outcomes; (f) have different roles and responsibilities; and (g) are together embedded in an encompassing organizational system, with boundaries and linkages to the broader system context and task environment.
>
> (p. 79)

As evident in the definition, a lot is happening in a work collaboration. Collaboration is not just about the work on a given topic (or the *what* at hand), but also about the why, who, how, where, and when that define, support, and execute the work. Given the vast number of variables that can be involved in a collaboration, the potential for challenges to arise should not be surprising. Yet despite the potential challenges, a shift to a collaborative focus has occurred globally across fields, with research consistently indicating that teams can be more effective than the sum of individual efforts (Mathieu, Wolfson, & Park, 2018). For example, over 90% of publications in science and engineering are co-authored by at least two individuals, with a push for engagement by more individuals in order to investigate multifaceted problems (National Research Council, 2015). Within research environments, collaborative work teams are often referred to as team science. Findings support the benefits to team science. For example, collaborative research teams have been found to have higher productivity, defined by the number of academic

publications, impact factors, and breakthrough discovery (see Aarons, Reeder, Miller, & Stadnick, 2019). In addition to academic indicators of productivity, positive societal outcomes have also been evidenced. One well-known example of collaborative research to address a public health issue can be found in campaigns to reduce tobacco use. Large-scale interdisciplinary research enabled reductions in men's smoking rates by more than half, which resulted in the first decline in cancer death rates in a century. This outcome was accomplished when a team of population, biological, social, and behavioral scientists (a) discovered that tobacco-use behavior was the primary cause of lung cancer and a leading cause of other diseases such as cardiovascular disease and (b) developed, disseminated, implemented, and evaluated smoking interventions at the individual, community, and policy levels, resulting in what is considered by some to be the most effective public health intervention to date (Mabry, Olster, Morgan, & Abrams, 2008).

Given the benefits of collaborative research projects, it is important to address the knowledge, skills, and attitudes necessary for successful collaboration. In advance of initiating collaborations, not only is core information (e.g., definitions of relevant terms and processes, structures and their respective roles) important but also awareness of potential challenges that can be proactively addressed. In this chapter, we frame discussion of the potential challenges around three themes. The first challenge is that *no one team is just like another*. We should think about each team as a snowflake, that is, uniquely different yet with common elements that can bind it. As noted by Salas and colleagues (2018), team variation can include

> skill differentiation; level of task interdependence (i.e., the degree to which team members have to depend on each other to accomplish a task); life span; virtuality (i.e., how often team members interact face-to-face vs. virtual communication); authority differentiation (i.e., the degree to which decisions are left up to a single individual on the team or distributed among the team members); team size; and team composition of gender, culture, and personality.
>
> (p. 595)

As we discuss in the third challenge and demonstrate in the chapter examples, teaming variables can be even more complex in school-based research, given the applied nature and consequent additional variables outside of immediate control of the research team.

The second challenge is *understanding the suitable conditions for teamwork* or the structures that need to be in place prior to beginning the collaboration (Salas et al., 2018). By structures, we refer to the organizational elements within the team as well as the larger context. Within the team, or inner structure, more obvious factors include establishing efficient management of processes, agreements, and communication. However, these inner structure teaming factors are also influenced by the larger organizational context, which can include factors such as management systems (e.g., personnel hiring and fiscal reporting), organizational technology, and policies that reinforce collaborative work (e.g., proposal distribution of credit and disbursement of indirect funds). Related back to our first challenge, although each team may need a different leadership and organization structure to function effectively, there are common elements to structure both within the team and across the larger context that can facilitate efficient and effective teaming.

Our third challenge refers to the applied focus of school-based research, which adds complexities as researchers engage with partners outside of the core research team to accomplish tasks. This challenge has been referred to as research teams functioning "in the wild" (Salas et al., 2018)—meaning that the *applied research collaborations are multi-dimensional* (i.e., multi-system, multi-stakeholder, and cross-developmental). Applied research collaborations present more partners with differing roles and expertise, moving parts to the collaboration, and often messy research designs. Salas and colleagues (2018) note that the majority of knowledge

gained to date on effective research team collaboration was conducted within lab settings, thus establishing need for future research agendas on team collaboration to extend to these additional challenges. However, although we certainly agree with the additional complexities as related to education research in applied settings tackling school and child health and well-being (see Sanetti, 2018), we also point to the literature on research-practice partnerships and community-based participatory research in our examples as providing structures to facilitate addressing this challenge. That is, similar to the purpose of creating sustainable multidisciplinary teams in laboratory settings as producing synergistic positive outcomes across time, the rationale for research-practice partnerships is to establish long-term collaborations of mutual benefit to both parties (Coburn, Penuel, & Geil, 2013). In community-based participatory research, even with focus on a particular research topic, foundational to the work is the goal of achieving social change to improve health outcomes, which is accomplished by full community participation in the research process and mutual respect for all partners (National Institutes of Health, 2011). Thus, if the ultimate aim for school-based research is to improve outcomes for intended populations (students, school personnel, and families), then research agendas should engage stakeholders in identifying gaps and designing solutions to be investigated in order to facilitate better alignment across research, policy, and practice.

Theoretical and Evidence-Based Considerations in Collaborative Research

Collaborative teams are commonplace in society and their scientific study has been ongoing for nearly a century (Mathieu et al., 2018). As previously noted, a shift to a collaborative focus has occurred across fields, including academia, given recognition that complex and vexing problems faced by society cannot sufficiently be addressed by individual researchers. The theory and evidence behind research collaborations has occurred through two avenues (National Research Council, 2015). The first is a body of social science research on groups in non-research contexts, such as military, industry, sales, and sports teams. The second is research that specifically investigates collaborations within research environments, also known as the science of team science. This interdisciplinary field has identified the necessity of collaboration among researchers from multiple disciplines to engage in large-scale scientific efforts or team science (Hall et al., 2018; Sanetti, 2018). Team science has been utilized over the past two decades to address challenging, social, environmental, and public health issues that have highly complex, multifactorial causes (Stokols, Hall, Taylor, & Moser, 2008).

As previously noted within our challenges associated with research collaboration, applied research projects are faced with additional complexities (Sanetti, 2018). Particularly with regard to research agendas that engage the whole child (those that integrate health and learning), collaboration can be required across diverse disciplines, child-serving systems, stakeholders, and developmental levels (see Figure 18.1). To be successful, teams need to stretch well outside organizational boundaries and have not just linkages but active collaborations with stakeholders in the broader system context and task environment. Despite a growing literature on scientific collaboration, there is relatively little research that addresses collaborations across disciplines, systems, and stakeholders to improve outcomes across developmental levels. Thus, to set up recommendations drawn from theory and research in related fields, we next provide an overview of the (a) history of theories related to work teams and (b) team science.

Theories of work teams. For over 50 years, the predominate framework for studying team effectiveness has been the input-process-outcome (IPO) framework (see Figure 18.2; McGrath, 1964). Inputs describe antecedent factors that enable and constrain team members' interactions. These include (a) *individual team member-level factors*, such as competencies, personalities, knowledge, and skills; (b) *team-level factors*, such as structure, cohesiveness, and group

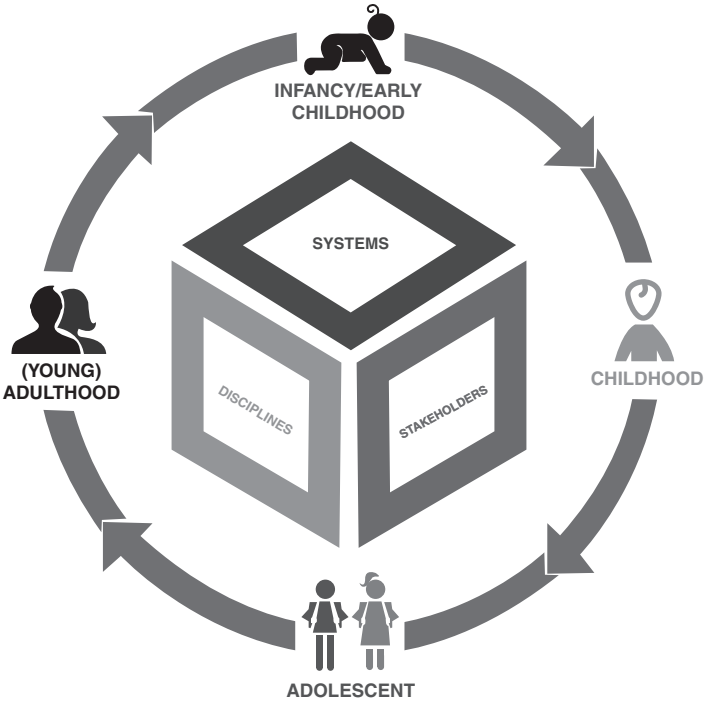

Figure 18.1 The multi-dimensional nature of school and child health research.

size; and (c) *environment-level factors*, such as reward structure and task characteristics. Per IPO, these antecedent factors combine to drive *team processes*, which encompass members' interactions related to task accomplishment. These processes are highly important as they describe how team inputs transform into outcomes. Outcomes include results and by-products of team activity that are valued by one or more stakeholders and are typically divided into *performance outcomes* and *affective reactions*. Performance outcomes may include, for example, quality and quantity of outcomes, efficiency, or time to achieve outcomes. Team members' affective reactions may include, for example, satisfaction with team functioning and outcomes, cohesiveness, and attitudes.

Historically, the IPO framework has been useful to researchers, but it has also been revised and extended in recent years. Common adaptations of the IPO framework have included placing it in a larger context, including a temporal component, and addressing the non-linear nature of team processes (Mathieu, Maynard, Rapp, & Gilson, 2008). A prime example is the Input-Mediator-Output-Input (IMOI) framework (see Figure 18.2; Ilgen, Hollenbeck, Johnson, & Jundt, 2005). The inputs in the IMOI framework represent the inherently multilevel nature of teams (individuals nested within teams nested within an organization), thereby highlighting environmental and organizational context factors that may influence the nature of, for example, leadership, task design, and other features related to teams and their work. Further, the mediators represent both (a) *team processes*, or team member actions, as in IPO, and (b) *emergent states*, or team members' cognitive, motivational, and affective states. Further, the IMOI framework addresses both (a) *developmental processes*, how teams qualitatively change and are differently influenced by factors across time, and (b) *episodic processes*, or feedback loops occur at certain times.

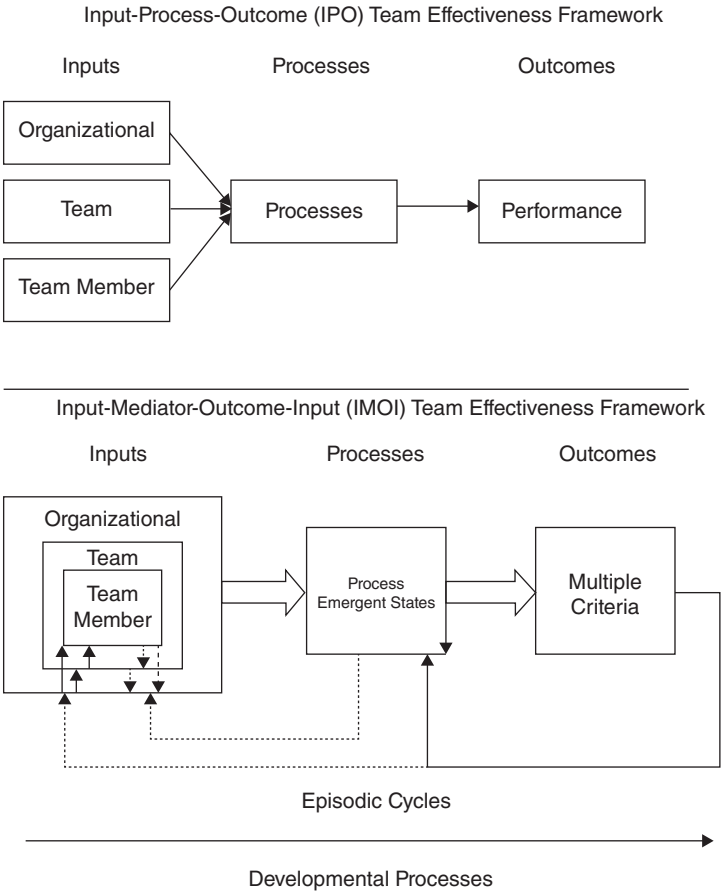

Figure 18.2 Team work frameworks.

Science of team science. Hundreds of primary research studies have been conducted, numerous meta-analyses have been performed, and many reviews of the work team literature have been published (Mathieu et al., 2008). Given the enormity of the literature base, we focus our review on the empirical findings specifically related to research teams. Unlike the larger field of work teams, the cross-disciplinary field called the Science of Team Science (SciTS) emerged in the early 2000s. The aim of SciTS is to develop an evidence base related to the "interacting and multilevel factors that influence the effectiveness of science teams . . . ranging from science policy to psychological factors" (Hall et al., 2018, p. 534). The evidence, to-date, in SciTS focuses on five themes: (a) characteristics of team composition, (b) institutional and organizational influences in team science, (c) factors related to the formation of science teams, (d) processes central to effective team functioning, and (e) outcomes of team science. The first three themes are aligned with the "inputs" stage of the IPO and IMOI frameworks, whereas the latter two are related to the "processes" and "outcomes" stages, respectively. A brief summary of the research in each of the five areas is provided next.

Team composition. Evidence suggests that team size and diversity are associated with outcomes. Specifically, the literature suggests an ideal team size of 6–9 individuals, although this may vary based on the research questions and other contextual factors (Bonaccorsi & Daraio, 2005; Hall et al., 2018). Interestingly, some studies have found smaller teams to be more likely

to develop new ideas, whereas larger teams were associated with higher productivity, greater impact, and furthering breakthroughs. A limited body of research exists on team diversity; however, available data suggest a moderate level of intellectual and cultural or ethnic diversity may be associated with increased impact and productivity (Dahlander & McFarland, 2013). Having at least one woman on the team is associated with increased likelihood receiving funding and increased publication citations, but gender diversity is not associated with differences in productivity or impact (Lungeanu & Contractor, 2015).

Institutional influences. The physical environment, institutional structures, and available resources influence both the establishment and productivity of research teams (Hall et al., 2018). Physical work layouts designed for collaboration as well as incentives for collaboration have resulted in increased collaborations, innovative products, and productivity (Hall et al., 2012). Availability of resources in general (e.g., physical, human, and financial resources) facilitates collaboration. Higher levels of resources are associated with increased impact and ability to sustain large teams (Adams, Black, Clemmons, & Stephan, 2005). That said, more complex collaborations require more robust resources and increased coordination; without sufficient resources, team productivity and impact may decline (Hall et al., 2018).

Formation of teams. Within-institution collaborations are more likely between individuals who cross paths regularly, whereas cross-institution and longer-distance collaborations are more likely between individuals who attend conferences (Dahlander & McFarland, 2013; Freeman, Ganguli, & Murciano-Goroff, 2014). Further, research shows that weak social ties can lead to team formation, but strong social ties are important in team sustainment (Dahlander & McFarland, 2013). Related research suggests that individuals tend to collaborate with the same individuals across time and projects (Lungeanu & Contractor, 2015).

Team functioning. Limited research has been conducted on the cognitive, motivational, affective, and behavioral states of research teams (Hall et al., 2018). Available data suggest face-to-face communication is important to the success of teams in that it facilitates (a) development of trust, (b) development of shared understanding across disciplinary boundaries, (c) knowledge sharing, and (d) effective communication. Furthermore, it results in increased productivity and impact (Binz-Scharf, Kalish, & Paik, 2015). Higher levels of coordination, or division of responsibilities among researchers, predict increased production of new knowledge and tools as well as training of students (Cummings & Kiesler, 2007).

Examples and Lessons Learned in Collaborative School and Child Health Research

Although researchers tend to collaborate with members of their own institutions (Dahlander & McFarland, 2013), scientific collaborations across academic units (Abbasi & Jaafari, 2013), institutions (Abbasi & Jaafari, 2013), and countries (Larivière, Haustein, & Börner, 2015) have been shown to have greater productivity and higher impact than individual researchers or less distributed teams. Further, cross-disciplinary teams have been found to publish more, in more diverse and higher-impact outlets, and develop more innovative products than single-discipline teams (Bales et al., 2014; Hall et al., 2012). Although greater attention to research on team science as relevant to school-based research is needed, examples do exist that provide implications for school-based researchers. As one example, the National Child Traumatic Stress Network (NCTSN) is a model for a high-impact, large-scale, interdisciplinary, team science initiative that involves collaboration among more than 50 universities and community-based treatment facilities in the identification, dissemination, and evaluation of evidence-based psychological treatments for children who have experienced trauma. Implementation within the NCTSN follows a learning collaborative model. In this model, groups of supervisors, clinicians, and administrators can apply for training, which includes (a) web-based videos and readings;

(b) three 2-day workshops, each separated by 90 days, that include guided learning activities, role plays, and breakouts; and (c) implementation and evaluation of NCTSN-selected treatment between workshops, with supervision or consultation and fidelity assessment. From initial research to implementation, NCTSN solicits feedback from stakeholder communities to identify and remediate barriers to implementation, sustainability, or both. Findings to date suggest positive results in adoption, implementation, and maintenance of evidence-based treatments, such as trauma-focused cognitive-behavioral therapy (Ebert, Amaya-Jackson, Markiewicz, & Fairbank, 2012).

As an example specific to our work with the University of Connecticut Collaboratory on School and Child Health, we share perspectives from a multidisciplinary team at the University of Connecticut Center for Advancement in Managing Pain (CAMP: https://painresearch.uconn.edu/). As noted on their website, the CAMP mission is to facilitate a "collaborative infrastructure for pain management professional and academic researchers from across disciplines to establish translational programs of research, implement interdisciplinary pain education, and develop innovative approaches for advancing the practice of precision pain management." As part of a podcast series sponsored by the Collaboratory on School and Child Health (csch.uconn.edu), Dr. Sanetti had the opportunity to interview two collaborators from CAMP, Dr. Xiaomei Cong and Dr. Angela Starkweather, regarding their perspectives on the strengths and challenges of team collaborations. Dr. Cong shared that complex issues in chronic pain for children and young adults most certainly requires a multidisciplinary team and that the research is enhanced when bridging disciplines such as biology, medicine, psychology, and social work. Dr. Starkweather agreed that a team science approach to the work is essential as different expertise is needed to understand underlying mechanisms with the ultimate goal to improve quality of life. For example, sometimes the focus of the work is on improving knowledge and skills of children and families in managing symptoms whereas other times it focuses on innovation of new molecules or agents through partnering with pharmaceutical scientists. Their group seeks to increase expertise as goals and opportunities change as well as works to build across disciplines in a way that adds new perspectives that facilitate their own understanding about treatment options. A critical piece to adding new collaborators is taking the time to share the ways that collaborators talk about their science in order to establish a common language and understanding about how things are viewed similarly or differently.

Dr. Starkweather believes that this time to value people's perspectives is important in setting and maintaining engagement in the process. Dr. Cong shared that, particularly when there is physical separation among team members, it is very important to establish communication schedules and agreements that start right at the beginning and continue as the team moves toward the goals. Both acknowledged the heavy investment of time in establishing teams, so you need to be willing to take a chance and embrace that each team has its own personality as you likely are not able to estimate where a particular collaboration might be in 5 years. However, both noted their perspective that the investment was worthwhile, stating their excitement at working with a large team where interactions with collaborators vary based on different opportunities and stages of a project.

A final example of an applied research project includes specific implications for community partnerships. We previously presented three challenges associated with applied research collaborations. As shown through the prior examples, the first two challenges—no one team is just like another and understanding the suitable conditions for teamwork—apply to every research collaboration. However, our third challenge is unique to applied research collaborations which can be multi-system, multi-stakeholder, and cross-developmental, and thus, projects involve factors outside of the direct control of the research team. That is, collaborations between research institutions and communities, specifically schools, are *applied* because they frequently take place in the daily settings of those they study and serve, and *interdisciplinary* because the

projects are built by stakeholders coming from different disciplines—those with research- and practice-driven missions, respectively. Perhaps the most common form of applied, interdisciplinary research that addresses the social, emotional, behavioral, physical, and academic needs of children includes program evaluations of the services offered in school or community settings (e.g., afterschool programs or activities delivered during the school day to provide academic mentoring or social skill development).

One example of a sustainable research-practice partnership comes from Dr. Russell's work in the Center for Applied Research in Human Development, where the team is in a second decade of work evaluating afterschool programming statewide in Connecticut. A crucial element to the success of the project is the community partner's ability to collaborate around data conceptually—to describe the data at hand and to envision what additional data would be possible and judge whether those data would help address questions of interest at their program sites. The community partners in this team have pre-existing data as well as analytics staff who understand (a) the nuances for every data point available for evaluation, (b) the measures that yielded the data, and (c) the data storage and transfer practices preferred by their agency that enable smooth collaboration and attainable project timelines. Much like what is found in many of their peer school- and community-based programs, most of the data elements for the project are collected as part of the accountability evaluation required by the funding agency. These elements include participant attendance, the provision of transportation to and from service, and the number of hours offered by service type. Although these specific elements may not lend themselves to particularly meaningful research questions regarding which program elements supported the greatest improvements for students and families, the team has never demurred when presented with a research question that might require collecting additional or slightly different data. The project's enduring success can be credited to (a) the depth of knowledge about data and its collection, storage, and transmission across team members and (b) their appetite for considering what else might be possible to strengthen the team's ability to ask and answer mutually defined questions about program impacts.

Recommendations and Suggested Readings

Research collaboration is essential to answer the complex and cross-system questions regarding youth development across academic, social, emotional, physical, and behavioral domains. Yet, few researchers have been trained to engage in effective research collaborations. The SciTS provides evidence of practices, policies, and processes that can facilitate optimal team development, processes, and outcomes. The National Research Council (2015) summarized the extant literature on key features to successful research collaboration, as demonstrated through effective team processes such as shared understanding of the purpose, task interdependence, and conflict management. Those targeted strategies that facilitate positive team processes include composition, professional development, and learning. We use these strategies as the foundation for recommendations and readings to enhance successful research collaborations in school and child health and well-being. Drawing from the parallel literature on effective community engagement, we expand on these strategies to more fully address our third challenge associated with applied research collaborations. Our recommendations are situated within collaboration planning, which has been defined by Hall, Vogel, and Crowston (2019) as "a deliberative approach to assessing the state of a team's environment(s) for a range of factors that may influence the likelihood and degree of its scientific and collaborative success" (pp. 587–588). A collaborative planning approach involves processes for identifying the key conditions, influences, and actions involved in a team, with the goal to establish a written plan that is initiated and formatively evaluated throughout the collaboration. Ten considerations have been defined in planning for successful research team collaboration, which are summarized in Table 18.1. As noted, the 10

considerations encompass the targeted strategies that have been shown to facilitate positive team processes (i.e., team composition, team professional development, team learning). In our table, we offer example questions within each domain to facilitate the planning and evaluation efforts specific to your team context. For further detail, we refer you to the comprehensive resources available within the National Cancer Institute's Team Science Toolkit (https://www.teamsciencetoolkit.cancer.gov/Public/Home.aspx). Next, we return to our challenges, providing brief discussion of each in relation to the 10 considerations for successful research team collaboration.

No One Team Is Just Like Another

Perhaps the first consideration related to this challenge is to clearly define the rationale for the team approach and consideration. As noted in Table 18.1, example questions to ask include "Why is a team approach necessary?" and "How does this team fit the need?" Answering these questions *before* official formation of a team is critical to ensure that the request for collaboration is clearly understood. One activity that the person contemplating forming the team may do is to engage in asset mapping, that is, defining both the necessary team roles and then identifying the strengths that each potential team member might contribute. In teaching a dissertation preparation course, Dr. Chafouleas encourages this sort of activity in helping students plan dissertation committee members, first asking students to define what they perceive to be their needed supports across content, methodological, and personal areas. Then students work to match potential committee members to those needs, resulting in the best combination of support.

Once a potential team has been identified, it is important to move to evaluation of collaboration readiness: What evidence supports that the individuals, the team, and the organization are ready for the collaboration? Of course, it is incumbent upon the team leader to attend to considerations related to communication and coordination, leadership, training, and budget and resources as all of these influence collaboration readiness and effective teaming. For example, a recent synthesis of transportable competencies (i.e., those competencies that hold regardless of the specific team or collaboration) identified 10 dimensions (Driskell, Salas, & Driskell, 2018). The dimensions closely align with the considerations presented in Table 18.1. With regard to those transportable competencies, we group them into 3Cs for simplicity. The first is *coordination*, which at its core is about organizing, including areas such as the purpose and goals, task plan, and timing. The second is *communication*, which refers to establishing common language and information exchange that is timely, clarifying, cueing, and acknowledging. Our third is *cooperation*, which refers to capacity for adaptability. It should be expected that teams will need to formatively monitor and adjust to changes that occur in order to continue to efficiently function, whether it be shifting task strategy, providing back-up supports to team members when needed, or addressing conflict and motivation.

The National Cancer Institute's Team Science Toolkit (https://www.teamsciencetoolkit.cancer.gov/Public/Home.aspx) offers multiple tools to facilitate establishing collaboration readiness. In particular, we suggest referencing example research team collaborative agreements as well as a team welcome letter. In addition, we offer two appendices that we have initiated within our research teams to set the stage for effective collaboration. In Appendix A, we provide an example agreement about authorship procedures and requests for data share. Our experience on projects that include cross-site and long-term collaboration with multiple team members coming and going (e.g., students and postdoctoral fellows) suggests such a priori agreements are highly useful in decision-making over the project period and beyond. Finally, in Appendix B, we provide an adaptation of a widely used worksheet to facilitate determining authorship. The worksheet should be used prior to engaging in a product to establish authorship expectations and should be re-evaluated periodically for adjustments.

Table 18.1 Ten Considerations in Planning for Successful Research Team Collaboration

Area	*Example Questions*
Rationale for Team Approach & Configuration	• Why is a team approach necessary? • How does this team fit the need?
Collaboration Readiness	• What evidence supports that the individuals, the team, and the organization are ready for the collaboration?
Technological Readiness	• What technological resources are available to support team data sharing, communication, and coordination? • What supports are needed to facilitate team member willingness and capacity to use technologies?
Team Functioning	• What is the collaborative history of this team? • What is the complexity of the task? • What strategies can be employed to strengthen key team processes?
Communication and Coordination	• How are the ways and strategies for communication described? • How has the coordination plan considered team complexity and size?
Leadership, Management, & Administration	• How do the leadership and management approaches fit the specific team context?
Conflict Prevention & Management	• How has conflict prevention and management been anticipated for the specific team context (demographic and disciplinary diversity), and what strategies have been described to proactively address?
Training	• What is the initial training plan for team members, and how does it address needs and incorporate evidence-informed approaches? • What plan is in place for ongoing provision of appropriate training?
Quality Improvement Activities	• What processes are in place to monitor team performance, and ensure ongoing collaboration is maintained and quality enhanced? • How does the range of monitoring options (e.g., debriefing, survey, facilitated discussion) meet the needs of the specific team context?
Budget and resource allocation	• How have funds been allocated to facilitate successful implementation of the collaboration plan? • How has the funding plan offered flexibility to account for changes to the collaboration over time?

Adapted from Hall, K., Vogel, A., Crowston, K. (2015, June 4). Collaboration Plans: Planning for Success in Team Science. Poster presentation at Science of Team Science (SciTS) Conference. Bethesda, Maryland. The full poster is available for download here: https://www.teamsciencetoolkit.cancer.gov/public/TSResourceBiblio.aspx?tid=3&rid=3261.

Understanding the Suitable Conditions for Teamwork

To us, this challenge is all about the leadership, management, and administration consideration. That is, team leaders must have the capacity to identify, plan for, and routinely monitor the conditions for teamwork, which includes attention to the other nine considerations to proactively identify and address barriers to effective teaming. Although we suggest this challenge is charged to the leadership to encompass all considerations, in this section, we specifically attend to examples as related to technological readiness, training, conflict prevention and management, and quality improvement activities.

Questions related to technological readiness refer not only to those resources available for data sharing, communication, and coordination but also the willingness and capacity of each team member to use technologies. In our own experiences, we have been challenged by both sides of this consideration. For example, when engaging in cross-site collaborations, we find that each institution provides its own set of unique issues related to human subjects institutional review boards, server access to facilitate data sharing, and secure communication options.

We have often found ourselves quite frustrated with technological issues across institutions, often not providing sufficient planning time to problem-solve and facilitate effective solutions (sometimes as "work-arounds") in the project set up period.

With regard to the willingness and capacity of each team member to use technologies, training plays a critical role, in relation to not only technologies (how to use technologies and associated team processes) but also team building (interpersonal relationships and processes). As one example, in their recent chapter on developing "big data" robust data management and data analysis procedures, McCoach, Dineen, Chafouleas, and Briesch (in press) provide multiple lessons that include emphasis on team training. For example, the authors note the importance of spending time at the start of a project to develop team-based norms, including training to establish commonalities across diverse team members. These norms can encompass simple commonalities, such as naming and labeling conventions for various documents as well as adherence to file organization and syntax organization structures. Establishing and maintaining consistent norms allows multiple people to work on the same tasks with greater ease, within and across time periods.

In relation to team building, the importance of tending to interpersonal relationships and processes cannot be overstated, particularly as the diverse demographic and disciplinary nature of teams increases. Building relationships that are respectful, honest, and include a degree of curiosity about one another's perspectives is ideal for positive team experiences, but this process takes time and can encounter challenges along the way. Strategies to prevent conflict should be identified in anticipation of potential challenges. Psychological safety among all research team members has been found to be a critical factor in team collaboration (e.g., Aarons et al., 2019; Salas et al., 2018). Psychological safety refers to security with open and honest communication at all times, ensuring that each team member is comfortable to speak up, particularly in times of conflict. Given the nature of human interactions, it should be accepted that conflict situations will occur and that support strategies of varied intensity will be necessary. The National Cancer Institute's Team Science Toolkit provides a number of resources related to team conflict across diverse stages of teaming and situations.

Finally, although likely obvious, it is important to include mention of quality improvement activities within this section on suitable conditions for teamwork. Quality improvement activities are those processes in place to monitor team performance and may include a range of options to meet the needs of the specific team context. For example, in addition to resource articles, the quality improvement materials included in the National Cancer Institute's Team Science Toolkit range from meeting observation tools to measures that evaluate team attributes, processes, and effectiveness. As previously noted, the options chosen will vary depending on the specific team context. For example, a large cross-site team may benefit from periodic surveys whereas a smaller team might be best served using debriefing or facilitated discussion formats. In summary, we strongly advocate that the team leader establishes the knowledge, skills, and attitudes necessary to implement a range of monitoring options and use the data in driving decisions about team needs for continual improvement.

Applied Research Collaborations Are Multi-Dimensional

Our final challenge brings additional dimensions to research team collaboration. As with the prior challenges, most certainly considerations around coordination, communication, cooperation, leadership, training, and budgeting are prominent in driving team effectiveness. However, the added complexities of research projects conducted within applied systems, meaning outside of the research context and often involving intersections across many child-serving systems (e.g., family, school, and community) magnify the required attention. In particular, the considerations must bring knowledge about effective research-practice partnerships, which honor the contexts and values of both rigorous scientific pursuits and agile service provision. Applied researchers share a commitment to using rigorous standards developed for bench science (e.g.,

comparative, controlled paradigms using valid and reliable tools for quantitative analysis) that are suitable for publication in peer-reviewed venues to contribute to the evidence base. However, school- and community-based programs are implemented and evaluated in a complex, rapidly evolving political context that requires timely feedback of results, as they are bound to municipal funding cycles that typically are not aligned with lengthy academic research and publication timelines. Thus, the insightful contribution of partners steeped in the cultures and practices of applied community settings like schools is invaluable to designing and completing a given project. The intersecting demands of rigor in methodology and utility of produced results creates a tension dating back as far as 50 years ago when funding for social service programs first proliferated through the Economic Opportunity Act (PL 88–452; US Government Publishing Office, 2019).

Given these added complexities, effort has been invested in producing resources to enhance community-engaged research. Many models and frameworks for community-engaged research have emerged in recent decades to address common challenges, such as engaging community involvement, overcoming differences and competing priorities between academia and community, working with non-traditional communities, and establishing a community advisory board (National Institutes of Health, 2011). In Table 18.2, we provide the National Institutes of Health's (2011) nine principles of community engagement. In this section, we expand on the principles with a few examples to assist in strengthening planning and monitoring efforts in research team collaboration that involves applied focus.

Like all team approaches, research-practice partnerships that invest in team-building position themselves to solve shared problems of interest in efficient, impactful ways (Kreaemer Tebes & Thai, 2018; National Institutes of Health, 2011). Perhaps the biggest challenge faced

Table 18.2 Nine Principles of Community Engagement

1	Be clear about the purposes or goals of the engagement effort and the populations and/or communities you want to engage.
2	Become knowledgeable about the community's culture, economic conditions, social networks, political and power structures, norms and values, demographic trends, history, and experience with efforts by outside groups to engage it in various programs. Learn about the community's perceptions of those initiating the engagement activities.
3	Go to the community, establish relationships, build trust, work with the formal and informal leadership, and seek commitment from community organizations and leaders to create processes for mobilizing the community.
4	Remember and accept that collective self-determination is the responsibility and right of all people in a community. No external entity should assume it can bestow on a community the power to act in its own self-interest.
5	Partnering with the community is necessary to create change and improve health.
6	All aspects of community engagement must recognize and respect the diversity of the community. Awareness of the various cultures of a community and other factors affecting diversity must be paramount in planning, designing, and implementing approaches to engaging a community.
7	Community engagement can only be sustained by identifying and mobilizing community assets and strengths and by developing the community's capacity and resources to make decisions and take action.
8	Organizations that wish to engage a community as well as individuals seeking to effect change must be prepared to release control of actions or interventions to the community and be flexible enough to meet its changing needs.
9	Community collaboration requires long-term commitment by the engaging organization and its partners.

Source: National Institutes of Health (2011). Available from https://www.atsdr.cdc.gov/communityengagement/pce_pubdevelopment.html.

in every community partnership project is the identification of measurable goals that are of shared value. It is common for community partners to defer to the research collaborators to set an agenda and play a leadership role in defining the scope and shape of a joint project. Although this may be appropriate in some planning aspects, it sets up the potential for a lopsided authority dynamic that too readily can overlook crucial values and practices of the project setting and undermines the shared leadership and mutual accountability that characterize effective teams (Kreaemer Tebes & Thai, 2018). Developing an objective that all collaborators are invested in pursuing is essential because this determines functional elements of a project that will require resource commitments from a range of project stakeholders. For example, some objectives will lead to resource-intensive research designs that require large staffing plans of highly trained or skilled facilitators. Others might require a more agile workforce but need careful retention plans to see a longitudinal timeline through. Furthermore, some might not require staff time or training resources but instead need new data collection, storage, and management practices. Regardless of the pragmatic implications that stem from design choices, articulating a shared purpose is one mechanism to keep partners positively engaged (Rosenfield, Newell, Zwolski, & Benishek, 2018) in the work that lies ahead, and such clear communication ensures that the outcomes from the project are valued by all sides of the collaboration.

A second critical point relates to the importance of relationships among partnering organizations. The essential role of relationship-building that allows for sharing and respecting each institutions' cultural values and practices has been undervalued at times, perhaps because it requires a time-intensive investment before concrete products are created. Too frequently, partnerships are quickly created in response to temporary funding opportunities without the depth of trust, understanding of respective organization cultures, and mutual appreciation of expertise that comes from long-term collaboration. These team characteristics, sometimes described as affective states, have been shown to mediate team success, particularly in schools (Rosenfield et al., 2018). As researchers respond to pressures to obtain the next grant, or publish high-impact peer-reviewed papers, they may be tempted to form collaborations that serve those ends but ultimately leave programs without useful skills or answers to shared questions. Conversely, service providers may be motivated to create discrete data collection and management practices that serve a single program's needs for its lifetime but not feel adequately supported to invest in more widespread, sustainable restructuring of these systems. Collaborating on research practices that are broader in perspective and can be adopted for wider use than for a single project or point in time communicates a stronger commitment to a sustainable partnership beyond isolated projects and encourages capacity building that will endure to strengthen the organization.

As a final point, applied researchers must contend with the limited utility of peer-reviewed scholarship products to the range of stakeholders investing in applied programs. The realities of ever-shrinking pools of resources for community-based service provision, including school-based programming, place pressure on research-practice teams to consider what goals, practices, and outcomes will be meaningful to each constituency involved in the partnership. These interdisciplinary teams must also partner in developing a frank description of available resources to support a given project and, then, how and to whom to communicate the results to the most meaningful effect. Developing advisory boards that identify key stakeholders including youth and their families from the project sites to serve as liaisons between the community and the program staff will increase the team's contextual validity when developing solutions to problems that arise (i.e., slower than expected recruitment, high attrition rates, or missing data), and give the collaboration credibility when disseminating results of their efforts. Finally, project products must serve the needs of all stakeholders, from the peer-reviewed products that drive academia and develop a rigorous evidence base, to the policy briefs, testimonies, press releases, and brief internal snapshots (e.g., infographics) that communicate program success to the community stakeholders in real time and serve as formative inputs for program improvement.

Implementation science and evaluation science are much strengthened by inclusive designs that encourage broad participation across program constituencies, and improvements can be seen in the useful application of results for meaningful impact.

Summary

Collaboration has become an expected component to research endeavors, yet teaming requires specific attention to the knowledge, skills, and attitudes necessary for successful collaboration. In this chapter, we presented three challenges to effective teams engaged in school- and child-focused research. The first two challenges—no one team is just like another and understanding the suitable conditions for teamwork—are faced by any team, whereas the third (applied research collaborations are multi-dimensional) is unique to applied research collaborations. Although extension of the science of team science to applied research collaboration is limited to date, we presented strategies for addressing the challenges by drawing from bodies of work in team science and community-engaged research. To begin, the 3Cs (coordination, communication, and cooperation) were discussed as transportable competencies that apply to any team. Then, strategies from research-practitioner partnerships were offered for addressing the additional complexities associated with school- and child-focused research teaming (multi-system, multi-stakeholder, and cross-developmental). Additional key resources on research collaborations, including materials to support team functions, are included at the end of this chapter.

Key Resources on Research Collaboration

National Cancer Institute Team Science Toolkit. https://www.teamsciencetoolkit.cancer.gov/public/Home.aspx The website houses information on instruments, measures, guidelines, and a peer-reviewed reference library to support your team processes.

W. T. Grant Foundation Research-Practice Partnerships. https://rpp.wtgrantfoundation.org/ Tips and examples in research-practice partnership topics such as structuring a partnership, developing a joint research agenda, and data sharing agreements.

American Psychologist 2019 Special Issue on the Science of Teamwork. https://www.apa.org/pubs/journals/special/4017313. The issue offers 20 articles that summarize the importance and current state of evidence regarding teams and teamwork across settings.

Appendix A
Example Agreement among Key Personnel

Project X: Authorship Procedures and Requests for Data Share

Definitions:
Primary collaborator—All persons named as key personnel on a written document outlining a project. Most often, this refers to the section "Key Personnel" found within a grant proposal.

Data—Anything produced under the grant project (e.g., video, datasets, protocols, databases, coding manuals, scoring materials).

Primary publications—Planned publications intended to address those research questions directly outlined on a written document outlining a project (regardless of funding status), and extends to all research questions revised or added following initiation of a project. That is, it is acknowledged that research questions tend not to remain static once a project is initiated and new thinking emerges as data and information are revealed.

Secondary collaborator—Any person not named as key personnel on a written document outlining a project.

Secondary use—Use of data for alternative purposes and/or planned analyses on datasets and resulting publications in ways that were not included as part of planning or initiation of a project. Associated data use (e.g., video, materials) must involve acceptable extension as determined by primary collaborators and the Project Director. For example, datasets are released to address research questions that are specific and not duplicate or conflict with primary publications.

Authorship Expectations

The unique and combined contributions of the primary collaborators in bringing the project to realization are fully recognized, with acknowledgment of the sizable efforts undertaken by each primary collaborator from conceptualization to final product. Thus, the following guidelines provide structure to expectations for acknowledging these contributions in resulting products:

- For each ***written product****, full acknowledgement of the funding source must be provided as follows:
  - Preparation of this article was supported by funding provided by XXX. Opinions expressed herein do not necessarily reflect the position of XXX, and such endorsements should not be inferred.
- For each ***written product****, each primary collaborator will be offered authorship (or right of first refusal). Order of authorship will be determined by the lead author in collaboration

with the Project Director, with expectation that collaborative and proactive discussion involving all primary collaborators. It is understood that authorship order is not a static determination but can be re-negotiated over time as roles and responsibilities shift.

- For each ***written product****, it is expected that there may be potential for secondary collaborators to serve as co-authors. Primary collaborators embrace this as part of our value and mission in teaching and mentorship. Co-authorship of a secondary collaborator will be considered based on contributions "above and beyond" the expected requirements of the job (e.g., worked hours as part of a graduate assistantship), and may include consideration of contributions to conceptualization and/or substantive effort. It is expected that the lead primary collaborator on a particular project will negotiate authorship roles and order throughout the process from start to completion, with expectation for collaborative and proactive discussion involving the Project Director and all primary collaborators.
- For each ***presentation***, it is expected that primary collaborators will engage in proactive discussion regarding "presenter-ship." Ordinarily it is not expected that all primary collaborators will be included as presenters on every presentation, but will be provided acknowledgement as a contributor either in the submission or at the beginning of the presentation. Decisions on best options will depend on the venue, with understanding that each presentation will include full acknowledgement of the funding source as indicated previously. It is expected that the lead presenter will negotiate discussions in advance with all primary collaborators, with understanding that presentation outlets provide a strong opportunity to further engage secondary collaborators.

*Written products of substantive nature, resulting from primary data analyses. Op-eds or other briefs may not apply but should be discussed in advance.

Requests for Data Share

Interest by others in the substantial work undertaken as part of Project X is appreciated, and we acknowledge that the extensive variety of data collected as part of the project may stimulate ideas to use and take data in new directions. Given the sizable work undertaken to realize the data, we welcome proposals for additional use under circumstances that consider (a) the nature of the request, (b) the interests of primary collaborators, and (c) distinction from the originally funded purpose. To that end, ideas to extend primary efforts in new and substantive directions with the goal to increase collective knowledge are encouraged. Although priority in use of resultant data is always provided to the primary collaborators, it is acknowledged that there may be opportunity to advance collective knowledge through collaborations with researchers outside of the primary personnel named in the initial project. Thus, procedures for review of requests to use data have been established, and apply to all data created under the Project Director.

Note. Under no circumstances is any person hired to work on the project allowed to maintain copies of data for future independent use. It is expected that all copies will be returned to the primary collaborator upon end of employment.

General Rules

- Data request for secondary use must be specific and represent an acceptable extension, and may only be used under the specifications agreed upon. In all circumstances, the primary collaborators/funding source must be appropriately acknowledged on any product produced by the secondary collaborator.
- Under most circumstances, data use will not be granted until the end of the project period.

- Datasets will not be available for use by secondary collaborators until all primary publications associated with the requested dataset have been prepared and in queue for publication.
- Proposals for any secondary analyses may not conflict with the primary project goals or overlap with new directions (revisions/additions) intended by primary collaborators following initiation of the project.
- Any proposal for use by a secondary collaborator must have direct involvement of at least one primary collaborator to provide appropriate bidirectional and collaborative communication.
- Generally, all primary collaborators will be offered authorship or opportunity to opt-out of authorship on any secondary publication through a 5 year period following completion of the primary project.
- Regardless of time period, all primary and secondary publications must acknowledge the original project funding information, including listing of all primary collaborators.

Request Procedures

- A written proposal should be prepared to minimally include detailed explanation of requested data (which data, for what purpose, accessed by whom and for how long). If a dataset is requested, then include (a) succinct rationale for the study, (b) specification of data requested, (c) proposed data analyses, (d) identification of at least one primary collaborator for direct involvement, and (e) plan for author and funding acknowledgement.
- The signed proposal should be sent directly to the Project Director.
- The Project Director will distribute to primary collaborators, and a process for review will be scheduled.
- Decisions regarding approval for use will be made by majority vote, with exception that the Project Director must grant final approval for use.

Appendix B

Example Worksheet for Determining Authorship

This worksheet can be used to establish expectations for authorship on various products. It should be completed prior to engaging in the specified product and should be re-evaluated periodically as adjustments may be needed as the project proceeds. The worksheet was adapted from procedures outlined in the following: Winston, Jr., R. B. (1985). A suggested procedure for determining order of authorship in research publications. *Journal of Counseling and Development, 63*, 515–518.

Product Title:	
Product Type:	
Collaborators:	

Directions:

1 Prior to beginning an expected product, collaboratively discuss any expectations regarding authorship (e.g., Project Director retains first authorship rights on all products). Make note of any decisions in advance of completing the worksheet.

Any pre-determined authorship decisions?	

2 Define the expected activities related to product completion. In discussing, evaluate using both qualitative and time-based criteria—meaning consider not only expected demand on time but also conceptual value. For each activity, assign corresponding point values, and also establish the minimum expected points for authorship. (Note. The example provided by Winston, 1985, more heavily weighted activities associated with conceptualization, data collection, and full draft writing.)

Activity	*Project Weighting*
Conceptualizing and refining ideas into research questions	
Searching literature	
Creating research design and selecting analyses	
Determining methods and procedures	
Collecting data	

Coding and cleaning data, establishing master databases	
Performing analyses	
Interpreting analyses	
Drafting product—introduction	
Drafting product—method and results	
Drafting product—discussion	
Finalizing product—complete first draft	
Managing submissions and review responses to completion	
Total points:	**300**

3 Next, assign the points within each activity by the expected contribution of each collaborator. For example, if the interpreting analyses activity is assigned 50 points and two collaborators are expected to contribute equally, then each collaborator would be assigned 25 points. Finally, establish the minimum expected points to be considered for authorship (Note. Winston, 1985, suggested a minimum of 50 points.)

Minimum Expected Points for Authorship:	

	Collaborator Initials				
Activity	*Points Assigned*				
Conceptualizing and refining ideas into research questions					
Searching literature					
Creating research design and selecting analyses					
Determining methods and procedures					
Collecting data					
Coding and cleaning data, establishing master databases					
Performing analyses					
Interpreting analyses					
Drafting product—introduction					
Drafting product—method and results					
Drafting product—discussion					
Finalizing product—complete first draft					
Managing submissions and review responses to completion					
Total points per collaborator:					

4 Finally, establish a schedule for re-evaluation of the activity points assigned by expected collaborator contribution in relation to actual contribution. Determine final authorship!

References

Abbasi, A., & Jaafari, A. (2013). Research impact and scholars' geographical diversity. *Journal of Informetrics, 7*, 683–692.

Aarons, G. A., Reeder, K., Miller, C. J., & Stadnick, N. A. (2019). Identifying strategies to promote team science in dissemination and implementation research. *Journal of Clinical and Translational Science, 4*(3), 180–187.Adams, J. D., Black, G. C., Clemmons, J. R., & Stephan, P. E. (2005). Scientific teams and institutional collaborations: Evidence from U.S. universities, 1981–1999. *Research Policy, 34,* 259–285.

Bales, M. E., Dine, D. C., Merrill, J. A., Johnson, S. B., Bakken, S., & Weng, C. (2014). Associating coauthorship patterns with publications in high-impact journals. *Journal of Biomedical Informatics, 52,* 311–318.

Binz-Scharf, M. C., Kalish, Y., & Paik, L. (2015). Making science: New generations of collaborative knowledge production. *American Behavioral Scientist, 59,* 531–547.

Bonaccorsi, A., & Daraio, C. (2005). Exploring size and agglomeration effects on public research productivity. *Scientometrics, 63,* 87–120.

Coburn, C. E., Penuel, W. R., & Geil, K. E. (January 2013). *Research-practice partnerships: A strategy for leveraging research for educational improvement in school districts*. New York, NY: William T. Grant Foundation. Retrieved from https://1ff99847xy5y3clikf2gqqb8-wpengine.netdna-ssl.com/wp-content/uploads/2019/10/Research-Practice-Partnerships-at-the-District-Level.pdf

Cummings, J. N., & Kiesler, S. (2007). Coordination costs and project outcomes in multi-university collaborations. *Research Policy, 36,* 1620–1634.

Dahlander, L., & McFarland, D. A. (2013). Ties that last: Tie formation and persistence in research collaborations over time. *Administrative Science Quarterly, 58,* 69 –110.

Driskell, J. E., Salas, E., & Driskell, T. (2018). Foundations of teamwork and collaboration. *American Psychologist*, *73*, 334–348.

Ebert, L., Amaya-Jackson, L., Markiewicz, J., & Fairbank, J. A. (2012). Development and application of the NCCTS learning collaborative model for the implementation of evidence-based child trauma treatment. In R. K. McHugh& D. H. Barlow (Eds.), *Dissemination and implementation of evidence-based psychological interventions* (pp. 97–123). Oxford, England: Oxford University Press.

Freeman, R. B., Ganguli, I., & Murciano-Goroff, R. (2014). Why and wherefore of increased scientific collaboration. In A. Jaffe & B. Jones (Eds.), *The changing frontier: Rethinking science and innovation policy* (pp. 17–48). Chicago, IL: University of Chicago Press.

Hall, K. L., Stokols, D., Stipelman, B. A., Vogel, A. L., Feng, A., Masimore, B., . . . Berrigan, D. (2012). Assessing the value of team science: A study comparing center- and investigator-initiated grants. *American Journal of Preventive Medicine*, *42*, 157–163.

Hall, K. L., Vogel, A. L., & Crowston, K. (2019). Comprehensive collaboration plans: Practical considerations spanning across individual collaborators to institutional supports. In K. Hall, R. Vogel, & R. Croyle (Eds.), *Strategies for team science success: Handbook of evidence-based principles for cross-disciplinary science and practical lessons learned from health researchers* (pp. 587–611). Cham, Switzerland: Springer Nature Switzerland AG.

Hall, K. L., Vogel, A. L., Huang, G. C., Serrano, K. J., Rice, E. L., Tsakraklides, S. P., & Fiore, S. M. (2018). The science of team science: A review of the empirical evidence and research gaps on collaboration in science. *American Psychologist*, *73*, 532–548.

Ilgen, D. R., Hollenbeck, J. R., Johnson, M., & Jundt, D. (2005). Teams in organizations: From input-process-output models to IMOI models. *Annual Review of Psychology, 56*, 517–543.

Kozlowski, S. W., & Ilgen, D. R. (2006). Enhancing the effectiveness of work groups and teams. *Psychological Science in the Public Interest, 7*, 77–124.

Kreaemer Tebes, J., & Thai, N. D. (2018). Interdisciplinary team science and the public: Steps toward a participatory team science. *American Psychologist, 73*, 549–562

Larivière, V., Haustein, S., & Börner, K. (2015). Long-distance interdisciplinarity leads to higher scientific impact. *PLoS ONE, 10*(3), e0122565.

Lungeanu, A., & Contractor, N. S. (2015). The effects of diversity and network ties on innovations: The emergence of a new scientific field. *American Behavioral Scientist, 59,* 548–564.

Mabry, P. L., Olster, D. H., Morgan, G. D., & Abrams, D. B. (2008). Interdisciplinarity and systems science to improve population health: A view from the NIH Office of Behavioral and Social Sciences Research. *American Journal of Preventive Medicine*, *3*, S211–S224.

Mathieu, J., Maynard, M. T., Rapp, T., & Gilson, L. (2008). Team effectiveness 1997–2007: A review of recent advancements and a glimpse into the future. *Journal of Management*, *34*, 410–476.

Mathieu, J. E., Wolfson, M. A., & Park, S. (2018). The evolution of work team research since Hawthorne. *American Psychologist*, *73*, 308–321.

McCoach, D. B. Dineen, J. N., Chafouleas, S. C., & Briesch, A. M. (in press). Reproducibility in the era of big data: Lessons for developing robust data management and data analysis procedures. In C. Hill & S. Kolenikov (Eds.), *Big data meets survey science*. Hoboken, NJ: Wiley.

McGrath, J. E. (1964). *Social psychology: A brief introduction*. New York, NY: Holt, Rinehart and Winston.

National Institutes of Health (2011). *Principles of community engagement* (2nd ed.) (NIH Publication No. 11–7782). Retrieved from https://www.atsdr.cdc.gov/communityengagement/.

National Research Council. (2015). *Enhancing the effectiveness of team science. Committee on the Science of Team Science*. N. J. Cooke & M. L. Hilton (Eds.), Board on Behavioral, Cognitive, and Sensory Sciences, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press.

Rosenfield, S., Newell, M., Zwolski, S., & Benishek, L. E. (2018). Evaluating problem-solving teams in K-12 schools: Do they work? *American Psychologist*, *73*, 407–419.

Salas, E., Reyes, D. L., & McDaniel, S. H. (2018). The science of teamwork: Progress, reflections, and the road ahead. *American Psychologist*, *73*, 593–600. http://dx.doi.org/10.1037/amp0000334

Sanetti, L. (2018). *Team science principles in school and health research.* Retrieved from https://csch.uconn.edu/wp-content/uploads/sites/2206/2018/10/CSCH-Team-Science-Report-Final-October-2018.pdf

Stokols, D., Hall, K. L., Taylor, B. K., & Moser, R. P. (2008). The science of team science: Overview of the field and introduction to the supplement. *American Journal of Preventive Medicine, 35*(2 Suppl.), S77–S89.

US Government Publishing Office (2019). Economic Opportunity Act of 1964. Retrieved from https://www.govinfo.gov/content/pkg/STATUTE-78/pdf/STATUTE-78-Pg508.pdf

Winston, Jr., R. B. (1985). A suggested procedure for determining order of authorship in research publications. *Journal of Counseling and Development, 63*, 515–518.