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# Team Building Without Boundaries


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## ABSTRACT

Team building can be challenging when participants are from the same discipline or sub-discipline, but needs special attention when participants use a different vocabulary and have different cultural views on what constitutes viable problems and solutions. Essential to No Boundary Thinking (NBT) teams is proper formulation of the problem to be solved, and a basic tenant is that the NBT team must come together with diverse perspectives to decide the problem before solutions can be considered. Given that participants come with different views on problem formulation and solution, it is important to consider a robust process for team formation and maintenance. This takes extra effort and time, but scholars studying teams of experts with diverse training have found that they are better positioned to be successful in solving even deep and difficult problems especially if they have learned to work well with each other. At this workshop we will discuss principles that scholars who have worked in NBT teams have discovered as effective. We will then engage with the workshop participants to consider discuss these principles and brainstorm to consider other approaches.



## CCS CONCEPTS

• A.1: Introductory and Survey • K.6.1: Project and People Management

## KEYWORDS

No Boundary Thinking, interdisciplinary science, team science





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## 1 Introduction

Since the early work of Pauling and Zuckerkandl in paleogenetics [14] and the sequence alignment efforts of Needleman and Wunsch [11], interdisciplinary team science has been a staple of bioinformatics and computational biology. Gauthier et al. [5] provides many examples of researchers from multiple domains working together to solve challenging problems throughout the history of the field. Today's projects are often sufficiently large or complex as to require a team science approach, employing the efforts of various disciplinary experts.

As an extension to traditional team science, No Boundary Thinking (NBT) [6, 7] is a novel method for approaching large-scale scientific challenges by accessing and synthesizing knowledge from all disciplines. In NBT, it is important to clearly define the scientific challenges and obtain input from a variety of stakeholders. This approach allows researchers to become more innovative in problem definition, resulting in questions (and solutions) that might otherwise not be readily apparent.

Extensive research has been undertaken on best practices for team science, team building, communication, and mentoring. We will examine some of those in this workshop and see how No Boundary Thinking techniques can contribute to building effective teams to address large-scale scientific challenges.

## 2 Where are the Boundaries?

Disciplinary boundaries are likely the first to come to mind when considering a team science approach. The expertise of the participants has been identified as one of the most important traits critical to developing effective teams. The integration of this diverse knowledgebase is also one of the key challenges to overcome [10]. In additional to learning to function on an interdisciplinary team, members may have the opportunity to learn about one another's disciplines [8].

Communication is often cited as a significant barrier to successful interdisciplinary projects, primarily due to lack of a common vocabulary. Learning each other's disciplinary languages to develop a shared terminology is crucial and has been shown to be a key characteristic of successful teams [2, 9]. In addition, ensuring frequent communication about data and results is necessary to move team projects forward [1, 13].

Trust between group members [1, 3] and development of solid interpersonal relationships [8] are also important. Cooke et al. [10] and Bezrukova [4] describe the intrinsic faultlines that exist within interdisciplinary teams. These faultlines can occur between subgroups with similar background within a larger team. The existence of these faultlines may exacerbate communication and interpersonal relationship issues.

## 3 An NBT Approach

We will take guidance from [12] and consider the following process framework for a no-boundary problem solution. Note that the framework addresses some of the boundaries described in Section 2, including integrating diverse expertise, developing a shared vocabulary, and addressing interpersonal relationships.

1. A vague (or crisp) sense of a problem emerges.
2. Invite a cross-functional team to consider the problem and better define it.
3. Adjust the composition of the team with the diverse expertise needed.
4. Attend to the psychological factors that are unique in teams with diverse perspectives.
    a. Consider approaches for flattening the hierarchy.
    b. Develop evidence-based techniques for listening and giving everyone a means to be heard.
    c. Be respectful and share and define vocabulary across disciplines.
    d. Train the team in empathy, listening, and communication as well as appropriate rhetorical skills.
5. Do not support parallel play unless it is clear and agreed that a distributed approach is best for the problem at hand
6. Develop a unified means for communicating the problem and its solution among the team and to the stakeholders.

## 4 Potential Discussion Questions

Further discussion is likely to lead us to uncover additional boundaries to team science, and potential solutions. Some potential discussion questions are below. We will also consider others based upon workshop participant experience.

1. Have teams on which you have participated formed in a bottom-up or top-down fashion. How does this effect the team dynamics?
2. How might we identify the diverse expertise needed at the problem definition stage?
3. How can we facilitate the effective communication and development of a shared vocabulary needed for such projects?

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