

# A Research Guide for Students and Teachers



State University of New York  
College of Environmental Science and Forestry



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*To the outstanding teachers who, by opening their classrooms to us, have changed the way we view the world.*



NSF GK12 Fellows at SUNY ESF Ranger School, Wanakena, NY, during the 2008 SUNY-ESF Environmental Science Summer Institute for Teachers.

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# Preface

As NSF GK12 Fellows, we have had the opportunity to work with many high school students conducting scientific research for the first time, and we realize that for many students this is a challenging experience. To help guide you through the process, we have written this research guide for you, the student, and for your teachers.

Through our work with high school students, we noticed that many students have misperceptions about how and why we do science. So why should you do research? The process of conducting research is the foundation of science and it provides the evidence that is needed to formulate and support the answers to many vital questions. By carrying out your own research you will develop the analytical skills that are helpful for interpreting the results from other studies that you may see in books, presentations, movies, etc.

This document is a step-by-step guide for someone who is conducting research for the first time. We will show you how to get started with your project by providing an overview of the research process, presenting different types of research, and sharing previous student projects. We will then show you how to determine what type of data you will need and how to collect and analyze the data. Finally, we will guide you through the process of presenting your research in a scientific journal-style paper and a conference-style oral presentation. You will be expected to complete milestones throughout your research process to assist you in staying on task, such as developing a research question, a hypothesis, a proposal, and an outline for your final paper,. It is our goal in writing this research guide to provide you with the tools that you will need for each step in the research process.

The process of research that you will learn by following this guide is not limited to the context of “science”. You can apply this process when trying to answer questions in any discipline. The skills that you will accumulate as you develop and carry out your own research project can be used in your future studies and professional life. Our goal is for you to acquire useful, transferable skills such as critical thinking, data collection and analysis, technical writing, and oral communication. Additionally, we want you to be scientifically literate citizens, so that you can understand and critique scientific issues that you will encounter in the media, in policy, and in your future education and work.

# The NSF GK12 project at SUNY-ESF:

## *Environmental Science to Promote Sustainable Urban, Rural, and Indigenous Communities*

The goals of National Science Foundation Graduates in K12 (NSF GK12) project are to enrich high school student science learning and engagement and to enhance teacher and graduate student professional development. We seek to increase the environmental knowledge and science literacy of today's high school students to produce citizens who will be able to make informed decisions regarding the environment. Through the graduate education program and service research we aim to produce environmental science leaders who will be able to meet the extraordinary environmental challenges of the 21st century. Within the theme of Sustainable Communities, our activities focus on experiential and inquiry-based classroom and field-based activities and graduate teaching fellow-facilitated student research projects. The activities culminate in the Environmental Summit, a student science symposium.

This NSF funded project builds upon two well-established college/school partnerships: the *ESF in the High School* dual enrollment program and the *ESF Science Corps*. The *Science Corps* embodies ESF's Vision 2020: A Better World through Environmental Discovery. The Science Corps supports campus-based, in-school, workplace and field-based STEM (science, technology, engineering and mathematics) learning and professional development experiences for middle and high school students and teachers.

We are currently collaborating with 26 high schools in urban, rural, and indigenous communities in New York, with the aim of engaging traditionally underrepresented and financially disadvantaged students.

For information about the NSF GK12 project, *ESF in the High School*, the *ESF Science Corps*, and other programs please contact:

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