

IDEAs in Action Curriculum

Focus Capacity: Natural Scientific Investigation

Students learn how to make and interpret scientific descriptions and explanations of the natural world, practice the skills of scientific inquiry, and evaluate scientific evidence within the contexts of both scientific communities and society.

Questions for Students

1. What rules govern the natural world and how are they discovered, tested, and validated?
2. What is distinctive about the approach to understanding employed in the natural sciences?
3. What challenges are encountered in making measurements of the natural world?
4. What are the limits of investigation in the natural sciences?

Learning Objectives

(modifications in bold)

1. Demonstrate the ability to use scientific knowledge, logic, and imagination to construct and justify scientific claims about **naturally occurring** phenomena, including validation through rigorous empirical testing.
2. Analyze and apply processes of **(removed: natural)** scientific inquiry as dictated by the phenomena and questions at hand. These include generating and testing hypotheses or theories **pertaining to the natural world**; using logic and creativity to design investigations to test these hypotheses; collecting and interpreting data **about the natural world**; making inferences that respect measurement error; building and justifying arguments and explanations; communicating and defending conclusions; revising arguments and conclusions based on new evidence and/or feedback from peers; and synthesizing new knowledge into broader scientific understanding.
3. Evaluate science-related claims and information from popular and/or peer-reviewed sources by examining the relationship between the evidence, arguments, and conclusions presented and by assessing consistency with existing knowledge from valid and reliable scientific sources.
4. Identify, assess, and make informed decisions about ethical issues at the intersections of the **natural** sciences and society.

The modifications to the learning objectives were approved by the General Education Oversight Committee on 3-26-2021.

IDEAs in Action Curriculum

Focus Capacity: Natural Scientific Investigation

Memo from the General Education Oversight Committee, April 2022

The learning objectives for the Natural Scientific Investigation (NSI) focus capacity state that students should “construct and justify scientific claims about naturally occurring phenomena,” and apply aspects of the scientific method that may include “generating and testing hypotheses or theories pertaining to the natural world,” and “collecting and interpreting data about the natural world.” In this memo, the General Education Oversight Committee (GEOC) provides additional guidance for how these aspects of the learning objectives should be interpreted.

First, we would like to explicitly state that **applying the scientific method is not sufficient for a course to fulfill the NSI Focus Capacity**. To fulfill the NSI focus capacity, students must apply the scientific method to naturally occurring phenomena. The role of the NSI focus capacity within the IDEAs in Action curriculum is twofold: it is designed to both train students in the scientific method and to expose them to the fact that there are natural laws that humans can understand but cannot control. No other aspect of the Ideas in Action curriculum *requires* students to look beyond the constructs of human society, and this is a critical component of the NSI focus capacity. Consequently, there are many science courses both inside and outside the Division of Natural Sciences that do not meet the requirements of the NSI focus capacity. At issue here is not the scientific merits of a course or field nor the degree to which it employs the scientific method, but rather whether it addresses the natural world.

The boundary between the “natural world” and the world of human invention is difficult to define, and disciplines such as linguistics, geography, psychology, and anthropology actively probe this boundary. In some cases, determining whether or not something is naturally occurring is an active area of inquiry! Furthermore, there are courses within the physical and life sciences that focus primarily on engineering, technology, or societal impact. Therefore, all courses that seek to fulfill the NSI focus capacity must be carefully evaluated to determine to what extent they probe naturally occurring phenomena that exist apart from human invention and manipulation. **The GEOC recommends that at least 75% of the material in courses that fulfill the NSI focus capacity should pertain to phenomena that are unequivocally naturally occurring.** This strict definition of “natural world” is required by the unique role the NSI focus capacity plays within the Ideas in Action curriculum.

When evaluating courses that approach the boundaries of the natural world, the GEOC provides the following guidance:

- Courses that focus on technological development and invention are generally more aligned with the learning objectives for the Creative Expression, Practice, and Production focus capacity than the NSI focus capacity. Courses with a technological focus should only fulfill the NSI focus capacity if 75% of the course content pertains to underlying natural laws and phenomena.

- Courses that apply the scientific method to subjects that fall outside the definition of the natural world established here can often meet the learning objectives of the Ways of Knowing focus capacity.
- Linguistics courses that focus on the biomechanics of sound production can fulfill the NSI focus capacity. While we acknowledge that there is active debate regarding whether or not grammar and syntax are biologically predetermined, these topics do not unequivocally lie outside the realm of human invention and are not guaranteed to meet the NSI learning objectives.
- Geography courses that focus on climate and/or the evolution and features of landforms can fulfill the NSI focus capacity. Courses that focus on how human societies adapt to geographical conditions should not fulfill the NSI focus capacity.
- Anthropology courses that focus on the evolution of hominids can fulfill the NSI focus capacity, but courses that focus on the development of human society should not be approved.
- Courses that focus on the biological structure and operations of the human brain (or the brains of other species) can fulfill the NSI focus capacity. Courses that focus on the human mind, including emotions, memory, and mental health, should not fulfill the NSI focus capacity.
- Courses on the philosophy of science can fulfill the NSI focus capacity if at least 75% of the course content is devoted to topics within the scope of natural science as opposed to the scientific process, epistemology, and metaphysics. In particular, writings by scientists should feature prominently in the assigned reading for any class that is approved for the NSI focus capacity.

In all cases, the course syllabi that are approved for the NSI focus capacity must also demonstrate that students apply the scientific method by using data to test hypotheses and justify or refute scientific claims.

Created by the General Education Oversight Committee, 4-28-2022