



## Basic sciences for sustainable development

NSTF DISCUSSION FORUM

CONCEPT DOCUMENT

26 – 27 October 2022

### Background

Basic sciences are defined by the International Science Programme (IPS) at Uppsala University as the scientific disciplines of mathematics, physics, chemistry, and biology. They are called basic sciences because they provide a fundamental understanding of natural phenomena. The IPS asks these questions on their website: “What is the justification for supporting basic sciences in low and lower-middle income countries? Will support to basic sciences contribute to poverty reduction?”.

There has been a debate in the science community and in society for some decades on whether it is valuable to pursue science for the sake of simply gaining knowledge or does scientific knowledge only have worth if we can apply it to solving specific problems or improving people’s lives? In other words, do we need both the basic sciences and applied sciences?

Basic sciences (also known as pure sciences) are about expanding knowledge regardless of the applications of the knowledge, which could be of a short-term nature. It does not focus on developing a product or service of public or commercial value. The main goal of the basic sciences is knowledge for knowledge’s sake. The knowledge so generated may (or may not) result in an application, whereas applied sciences aim to use basic sciences and/or other applied sciences to solve practical problems.

The NSTF made a [Special Annual Theme Award](#) for work in the Basic Sciences for Sustainable Development, as part of the [NSTF-South32 Awards](#) on 21 July 2022. We define basic sciences to be mathematics, physics, chemistry, biology, but with the inclusion of astronomy and earth science.

A report by the United Nations Educational Scientific and Cultural Organisation (UNESCO) found that there is a complete lack of data on science education from low-income countries. The report, [Deepening the debate on those still left behind](#), analysed primary and secondary education data from 120 countries, but only 28 of the 82 low- and low-middle-income countries were represented, and there was no assessment data for science in any low-income country. This indicates how under-valued science education is on our continent. In South Africa, the proportion of learners who take mathematics and physical science for matric continues to dwindle.

The basics of basic science subjects should be learnt at school. As these form the foundations of all sciences, it is critical that learners choose these subjects at FET level (Grades 10-12), especially mathematics.

## Purpose and objectives

This Discussion Forum provides a platform to share knowledge on the connections between the basic sciences and the solutions they have made possible. It will focus on areas that are important for Sustainable Development, as defined by the United Nations' Sustainable Development Goals (SDGs). The discussions will highlight the importance of the basic sciences, including the critical importance of learning and teaching them at school level. We invite scientists from various fields of expertise to discuss these matters. The NSTF aims to raise awareness of the basic sciences, promote cooperation and networking, and encourage the sharing of best practice and experiences.

## Benefits of basic sciences

Basic sciences are known ultimately to have contributed to improving the quality of life of human beings, through their contributions to medical sciences, agricultural sciences, space sciences, etc. These applied sciences, in turn, have generated technologies that have improved our lives dramatically, and continue to do so. Applied sciences and technology inform and influence decision making on many levels, including national and global. Basic sciences ultimately form the foundations on which applied sciences explore and develop technological solutions. In this manner, basic sciences can have significant, but indirect influence on public policy and communal or personal decisions on: energy, conservation, agriculture, health, transportation, communication, defence, economics, leisure, and exploration, among others. While some of the impacts of science on society may not be obvious, many are. With the help of science, we have knowledge about promoting health, safety, and environmental stewardship. Scientific knowledge also forms the basis for technological advancement. From a simple light bulb to a complex computer, to genetic engineering and space travel, they are all human-made technologies, which are not possible without basic scientific knowledge.

## Themes

1. How do basic sciences contribute to knowledge that everyone should have?
2. How do basic sciences contribute to public guidelines on hygiene, measures to contain a pandemic and on nutrition?
3. How do basic sciences contribute to innovative solutions for the energy crisis?
4. How do basic sciences contribute to conservation of nature and biodiversity?
5. How do basic sciences contribute to solutions to adapt to and mitigate climate change?
6. How should the basic sciences be taught at school?

## Outcomes

We aim to answer the question: *How will support for the basic sciences contribute to the attainment of the SDGs, particularly in South Africa?*

We aim to formulate recommendations:

- On how to promote the basic sciences
- On how to bring the basic sciences to the public and the youth
- On education policy at school level in relation to subject choices

## Outputs

The following outputs will be produced and made available on the NSTF website:

- Video recordings of the speakers presenting their talks
- The speakers' slide presentations (with their permission)
- Written proceedings, including audience discussion

- Media release, summarising the issues and recommendations

#### References

<https://www.isp.uu.se/basic-sciences/>

<https://courses.lumenlearning.com/wm-nmbiology1/chapter/basic-and-applied-science/>

[https://undsci.berkeley.edu/article/0\\_0\\_0/whathassciencedone\\_07](https://undsci.berkeley.edu/article/0_0_0/whathassciencedone_07)

[UNESCO Report: \*Deepening the debate on those still left behind\*](#)