

Areas of knowledge

How do we know things? We know things because we use a range of methods of inquiry that incorporate ways of knowing to help construct knowledge in different areas of knowledge (AOKs).

The theory of knowledge course distinguishes between eight AOKs:

- mathematics
- natural sciences
- human sciences
- history
- the arts
- ethics
- religious knowledge systems
- indigenous knowledge systems.

Students must explore a range of AOKs. It is suggested that **six** of these eight would be appropriate.

While this guide identifies eight broad AOKs, students should be encouraged to think about individual academic disciplines, that is, to think about the nature of knowledge in their own specific IB subjects, such as chemistry, geography and dance.

Knowledge framework

One effective way to examine the AOKs is through a knowledge framework. A knowledge framework is a way of unpacking the AOKs and provides a vocabulary for comparing AOKs.

For each AOK the following can be examined:

- scope, motivation and applications
- specific terminology and concepts
- methods used to produce knowledge
- key historical developments
- interaction with personal knowledge.

Within this knowledge framework, key features of each area are identified, as are specific terminology and concepts which shape that area of knowledge. The key historical developments that have influenced and shaped each area are identified, as well as the ways that each makes use of particular methodology. Finally, there is opportunity for reflection on the interaction between shared and personal knowledge in each area. Knowledge frameworks are a very effective device to compare and contrast areas of knowledge.

The idea is that each AOK can be thought of, broadly speaking, as a coherent whole—a vast system with a rich inner structure. TOK aims to explore this structure and to understand just what it is that gives each AOK its particular character. It is also concerned with what these AOKs have in common. A useful strategy is to build a TOK course around comparing and contrasting the various AOKs, to look for features they have in common but also to highlight their differences and pinpoint what gives each its own characteristic flavour.

Comparison of different AOKs is not purely a descriptive task. It is analytical in the sense that the student should link the practices of inquiry to the knowledge that comes out in the end. For example, the reliability of knowledge within an AOK will depend critically upon the methods used to produce it.

Making links of this sort is what is meant by analysis in TOK.

1. Scope/applications

This component attempts to explore the range of the specific AOK within the totality of human knowledge and how that knowledge is used. Scope refers to the definition of the AOK in terms of subject matter, and the form that an AOK takes depends critically upon the nature of the problems it is trying to answer.

For example:

- biology studies living organisms and is mainly concerned with how they function
- mathematics is the study of quantity, space, shape and change
- in engineering, however, precise numerical methods are a matter of life and death
- music might not seem concerned with solving practical problems at all but the composer has to solve the “musical engineering” problems of building a piece of music; it has to be a unified whole and yet at the same time there has to be some sort of inherent contrast there to provide tension and energy and, for the listener, interest.

Exploration of the scope and applications of a particular AOK can lead to interesting discussions of the ethical considerations that have to be taken into account. Practitioners in a particular AOK might not be permitted to explore all the aspects that are of interest. There might be moral and ethical limits on the sort of investigations they undertake and experiments they perform.

2. Concepts/language

This element explores the way in which language is used in the production of knowledge in each AOK. The key idea is that language does not just communicate pre-existing “non-verbal” knowledge but that, in many cases, the language used actually constitutes knowledge. Take language away and there is nothing left. One of the reasons for this is that the language names concepts—these are the building blocks for knowledge. An AOK is a system of relationships between its key concepts. Different building blocks build quite different AOKs and produce different ways of thinking about the world.

For example:

- in physics key concepts include those of causation, energy and its conservation principle, field, charge and so on
- in visual arts we might be concerned with the colour palette, texture, composition, movement, symbolism and technique
- in music the central concepts might be melody, rhythm, harmony, tension, relaxation, texture and colour.

Discussions of the concepts and language that shape an AOK can link well to discussions about shared knowledge. Language allows knowledge to be passed on to others and to be accumulated over time for future generations. This is what makes this sort of knowledge “shared knowledge”. The fact that it can be communicated between individuals across space and over time is important. A significant proportion of current knowledge is not new but has been passed down to us from the past or from other parts of the world.

3. Methodology

One of the most striking differences between the AOKs is the methods that they use. Examining and comparing the methodologies of the different AOKs begins with students being able to identify the

specific methods or procedures used in an AOK, and exploring the assumptions that underlie those methods.

Assumptions and values play an important part in the methodology that underpins the production of knowledge. Each AOK establishes certain things as being important and others less so—each has a set of values that underpin the knowledge that is produced. No AOK is value free—some methods are better than others, some facts are more reliable than others, some theoretical models give better understanding than others. Recognition of these values and how they affect the methodology that is used is crucial to understanding the character of the AOK.

For example, in the natural sciences, much knowledge comes about through testing hypotheses by experiment; this assumes that laboratory conditions accurately mimic what happens in the rest of the universe and that the world can be understood as a system of causes determining effects.

One way to explore methodology is to examine the question of what counts as a fact in this particular AOK. Another way would be to examine the question of what counts as an explanation in this particular AOK. For example:

- in history, an explanation might consist of an overarching theory giving plausible motivations to the various historical actors that joins up the isolated historical documents
- in literature, the explanation of text might involve examination of its themes, motives and characterization through the literary devices employed.

Another way to explore methodology is to examine any constraints on the methods that can be used; for example, ethical constraints on experiments conducted in the human sciences.

4. Historical development

AOKs are dynamic entities that change over time as conceptual developments and advances are made in methodology. This need not be seen as a problem but rather an advantage—our systems are flexible and capable of responding to developments. Knowledge can, therefore, be considered provisional.

For example:

- consider a Swedish school textbook in history from 1912: it is quite different in its idea of history from those used today; a physics textbook from 1912 seems to have much the same idea about physics but the content is likely to be different
- an artwork might derive much of its meaning from the historical context in which it is produced and might even reference other earlier works.

Tracking the rough historical development of an AOK is a valuable tool in TOK. It is tempting to speculate that if we re-ran the history of human knowledge then the AOKs might look quite different to their current form. How much of our knowledge depends on accidents of history? Are certain AOKs more susceptible to these historical factors than others? Even our systems of measurement (m, kg, s) are historically situated and so, of course, are the concepts and the language employed by subject disciplines. Interesting discussions can be had over why particular historical events and factors have had such an impact on the development of a particular AOK.

5. Links to personal knowledge

There are links and interactions between shared and personal knowledge. Individuals contribute to shared knowledge. Their contributions have to go through whatever validation procedures are required by a particular discipline in order to be counted as “common” knowledge in that area. But shared knowledge also contributes to an individual’s own understanding of the world. This is one, but not the only, purpose of shared knowledge—that it enables individuals to make sense of the world. The nature

of this interaction between shared and personal knowledge is the last component of the knowledge framework to be examined. It is important because it addresses the question “so what does this mean for me?” What impact do these AOKs have on our individual lives and the way in which we view the world? How does this area form or change our perspective?

Specific areas of knowledge

On the following pages there is a brief introduction to each AOK. There are also diagrams providing examples of how each AOK could be approached, including suggested topics for study and knowledge questions. It should be noted that these are **suggestions only**, and can be used or substituted for others according to the specific interests and needs of the TOK teacher and students. These diagrams are tools which teachers should use with good judgment, being careful not to use them in such a way that the course becomes formulaic.

Mathematics

Is there a distinction between truth and certainty in mathematics? Is mathematics independent of culture? Is mathematics discovered or invented?

Mathematics is founded on a set of more or less universally accepted definitions and basic assumptions. It proceeds from a system of axioms using deductive reasoning to prove theorems or mathematical truths. These have a degree of certainty unmatched by any other area of knowledge, making it excellent raw material for study in TOK.

Despite, or rather because of, the strict confines of mathematical logic, mathematics is an enormously creative subject, asking of its practitioners great leaps of the imagination. Pure mathematics requires no prior sense perception at the start of inquiry but the application of mathematics to real-world situations requires techniques such as those used in the natural and human sciences. Indeed, most research in the natural and human sciences is underpinned by mathematics. There are also often close links between mathematics and the arts where formal requirements for harmony or symmetry impose mathematical structures on a work.

Natural sciences

What does it mean for a discipline to be a science? Is there just one scientific method? Should there be ethical constraints on the pursuit of scientific knowledge?

The natural sciences seek to discover laws of nature—regularities in the natural world. These are often causal relationships of the form “if X happens then Y will be the result”. This description implies that there is an attempt to produce a system of knowledge that is independent of human agency. Whether this is indeed possible is a matter of debate.

The methods of the natural sciences based on observation of the world as a means of testing hypotheses about it are designed to reduce the effects of human desires, expectations and preferences, in other words they are considered objective. In this sense, the natural sciences emphasize the role of empirical inquiry: scientific knowledge must be able to withstand the test of experience and experiment.

One interesting area of discussion is what differentiates the scientific from the non-scientific. Many would suggest that it is the methods used in science. It is therefore interesting to consider what it is about these methods that mean that the knowledge they generate is often regarded as more reliable than those employed by other AOKs.

Human sciences

To what extent are the human sciences reliable? Can human behaviour be subject to laws in the same way as the material world? What constitutes good evidence in the human sciences?

In TOK, the term “human sciences” includes many of the subjects in group 3 (individuals and societies) in the Diploma Programme. In simple terms, the human sciences study the reality of being human. More specifically, the human sciences study the social, cultural and biological aspects of human existence. If we add the study of human behaviour to this definition then the Diploma Programme offerings cover a range of human sciences including psychology, social and cultural anthropology, economics and geography.

A fundamental difference between human sciences and natural sciences is in the interpretation of the word “science”. The human sciences might be classified as science because they use the scientific method to test the validity and reliability of hypotheses. However, unlike the natural sciences, the phenomena they try to explain might not possess hard and fast laws that admit no exceptions. They might therefore resort to statistical methods to establish their findings, producing knowledge that is less reliable in terms of issuing predictions.

History

What is unique about the methodology of history? Is eyewitness testimony a reliable source of evidence? How do we decide which events are historically significant?

History is an area of knowledge that studies the recorded past. It raises knowledge questions such as whether it is possible to talk meaningfully about a historical fact and what such a fact might be, or how far we can speak with certainty about anything in the past. Studying history also deepens our understanding of human behaviour, as reflecting on the past can help us to make sense of the present.

Documentary evidence plays an important role in history, which raises questions about the basis for judgments of reliability of that evidence. The individual historian also plays an important role in history and in the 20th century there was much debate over whether historical facts exist independently of historians. Some argue that there is always a subjective element in historical writing because historians are influenced by the historical and social environment in which they are writing and this unavoidably affects their selection and interpretation of evidence.

The arts

How can the subjective viewpoint of an individual contribute to knowledge in the arts? On what basis can the merit of a work of art be judged? Is there any point in discussing the arts—should we not simply experience them?

“The arts” is a collective term that encompasses the creative productions of humans and encompasses the visual arts, the performing arts and the literary arts. The arts explore the experience and reality of being human and are an essential element of culture.

The arts could be thought of as creating a bridge between personal knowledge and shared knowledge. Many of them are collaborative. They use emotion as a currency to generate significance at a personal level but reason provides a restrictive framework necessary for the creation of meaning: artworks have their own inner logic. Some regard the arts as having an extra-artistic cognitive function, that they have a message about man’s place in the world which might have social or political implications. For example, there might be a case for supposing that the arts have an important function as a medium for social criticism and transformation. In any case, there is a widespread belief that the arts have a higher purpose to educate by encouraging introspection and sometimes making us think about how we should live our lives.

Ethics

Is there such a thing as moral knowledge? Does the rightness or wrongness of an action depend on the situation? Are all moral opinions equally valid? Is there such a thing as a moral fact?

One thing often said to distinguish humans from other animals is morality. A key question in ethical discussions in TOK is therefore whether we can really know whether something is moral. What is peculiar about moral values is that they seem to embody obligations for action.

An example of a key area of discussion in ethics is the issue of moral rules. There is disagreement about whether being moral is about following rules, not least because some would question whether moral rules really exist at all. There is also debate about whether moral rules should ever be broken, and if so, in what circumstances. Other key areas of discussion include the issue of whether humans are essentially altruistic or selfish, or whether the consequences of, or motivation for, an action is the location of moral value.

Religious knowledge systems

How do we decide between the competing claims of different religious knowledge systems? Can there ever be a basis for religious knowledge that is independent of the culture that produces it? Is atheism as much a matter of faith as religious belief?

Religious knowledge systems offer answers to fundamental questions about the meaning and purpose of human life. This area of knowledge incorporates a diverse range of different beliefs and systems; for example, varieties of theism, pantheism and polytheism. Some people believe that there is one true religion whereas others, known as religious pluralists, argue that the different religions are just different reflections of the same underlying truth. Religious knowledge has both a shared and personal dimension and offers a concrete context, within the TOK classroom, to explore the links between the two.

Religion is often regarded as a sensitive area in which discussions should be had with caution, in part because people have very personal and deeply held convictions regarding religious matters. However, for many people their religion has a major impact on how they understand the world, permeating their thinking and influencing their understanding of other AOKs, for example, the idea that ethics and religion are inextricably linked. In any case, for many, religion provides a backdrop to all the other knowledge they have.

Indigenous knowledge systems

In what ways are sense perception and memory crucial in constructing knowledge in indigenous knowledge systems? How do beliefs about the physical and metaphysical world influence the pursuit of knowledge in indigenous knowledge systems? How do indigenous people use the concept of respect to relate to their view of the world?

Indigenous knowledge systems explore local knowledge unique to a particular culture or society. The term usually refers to the knowledge constructed by a particular group of people such as the Namaqua people of Southern Africa, the Secoya people of Ecuador and Peru, the Ryukyuan people of Japan and the Wopkaimin people of Papua New Guinea. An important feature of indigenous knowledge systems is that they are not static. They are dynamic as a result of both internal and external influences. The Maori knowledge system today, for example, is a mixture of traditional knowledge and knowledge inherited over time from exposure to European culture.

TOK students can explore this AOK from a general, broad point of view to raise awareness of the

diversity of indigenous knowledge systems or they could study a particular indigenous knowledge system. When studying indigenous knowledge systems, it is important to examine the methods of communication, decision-making processes, thinking processes and the holistic view of knowledge.