There are a number of substantial changes of emphasis in the new TOK subject guide. The new emphases can be articulated in a brief narrative as follows.

1. **Knowledge** can take many forms.
2. TOK encourages students to examine how we know what we claim to know by analysing **knowledge claims** and exploring **knowledge questions.**
3. When discussing knowledge we can make a distinction between **shared and personal knowledge.**
4. Most knowledge is shared knowledge.
5. Much of this shared knowledge is organized into **areas of knowledge (AOKs).** In order to examine these areas of knowledge we can use the **knowledge framework.** The framework specifies five key features of each AOK: scope and applications, language and concepts, methodology, historical development and links to personal knowledge.
6. Discussions of **ways of knowing (WOKs)** are most effective when they occur naturally as part of explorations of how AOKs operate, rather than being discussed in isolation.

Each part of this narrative is unpacked below.

**Knowledge can take many forms**

The TOK guide presents the metaphor of knowledge as a map. A map is a simplified picture of the world that allows us to navigate our way through the world. However, a map only represents some aspects of the world, as it would be impossible to map every single aspect perfectly accurately. The power of maps is precisely this, that they are simplifications that allow us to gain understanding of the complexities of the world.

The usefulness of a map depends on a number of factors, including how accurately it pictures the world and how appropriately it is tailored to its task. A map of the London Underground would not be appropriate for navigating the streets of the city above ground, even though it is an accurate representation of the topology of the underground rail system. It is more appropriate, therefore, to talk of the accuracy and appropriateness of a map rather than its truth. In fact, all maps by definition are false in that they are necessarily simplified and by their nature are not true representations of reality. Similarly, it makes more sense to speak of knowledge, in a TOK context, as being accurate and appropriate to its task rather than to dwell on its truth.

In the previous TOK course, many students were taking the view that knowledge was belief plus something else. Usually, that “something else” was that the belief was true and justified. In many senses, this condition is too strong and leads to a situation in which very little can be known. This produced difficulties in dealing with AOKs in which knowledge seemed to be evolving, such as the natural sciences. If this definition were strictly applied, then the results of science are only beliefs to be jettisoned when new methods or theory came along. But this is a somewhat simplistic picture and counter to actual practice. Newton’s laws, for example, are still considered knowledge and are still taught in physics classes (they got man to the moon after all), despite Einstein showing them not to be true in a strict sense. The previous guide, with its emphasis on belief and truth, suggested a model of knowledge that was badly adapted to dealing with knowledge in the arts or literature and tended to demote the knowledge required in, say, playing a sport, cooking or playing a musical instrument to the status of mere skill. This produced a rather one-sided approach and weakened the link between TOK and creativity, action, service (CAS). The adoption of the justified true belief model also meant that Western knowledge was taken to be the dominant paradigm for all knowledge, and the history of knowledge was seen as the history of Western ideas.

The new guide adopts the metaphor of the map for knowledge, which, it is hoped, will remove the problems associated with knowledge being primarily a property of an individual’s belief and will allow a greater variety of aspects of human life to receive a TOK treatment than was previously the case.

**Knowledge claims and knowledge questions**

One of the most perplexing areas for new TOK teachers and students alike is the definition and role of knowledge claims and knowledge questions (previously known as “knowledge issues”) in the course. An understanding of knowledge claims and knowledge questions is the basis for developing TOK thinking.

**Knowledge claims**

Knowledge claims form the basis for TOK thinking. They are claims about knowledge and are used in TOK as the basis for developing discussion about WOKs and AOKs.

In TOK, a knowledge claim is something that the claimant believes to be true, yet is also open to discussion and debate. It is therefore important that a knowledge claim is something that we believe we know and that we want to assess the validity of.

There are two different types of knowledge claims—the first type is claims about the world, and the second type is claims about knowledge.

* An example of a claim about the world is: “Hydrogen is the lightest chemical element.”
* An example of a claim about knowledge is: “The knowledge that hydrogen is the lightest chemical element is quite secure because the methods of chemistry give us a fairly good model of what chemical elements look like.”

This second claim is a claim about the reliability of the methods of chemistry itself, not about hydrogen. It is therefore a claim about knowledge, or a “second order knowledge claim”. TOK is much more interested in this type of claim.

**Knowledge questions**

We assess the validity of a knowledge claim by asking good quality inquiry questions. In TOK, these inquiry questions are called knowledge questions. The guide refers to these questions as second-order questions. By this we mean that they are not simply questions of knowledge, but questions **about** knowledge. They focus on how we produce the knowledge required to explore the question, and are more open and contentious than the type of question that students typically explore in their subject lessons.

For example, in a geography lesson a student might explore the question “how are contour lines used on maps to indicate topography?” This is a specific first-order question about geography. However, in a TOK lesson a related knowledge question might be “to what extent do maps represent reality?” This is an open second-order question about knowledge.

Students will need assistance in understanding how to identify and construct a knowledge question. One approach is to start with more basic knowledge questions, and then build up to more sophisticated knowledge questions.



Figure 1

Good quality knowledge questions involve evaluation, and will start with a term that implies a requirement for evaluation. For example:

* to what extent …
* under what circumstances …
* at what point …
* on what basis …

Both the TOK essay and presentation require clear and explicit identification and evaluation of knowledge questions. A good exercise is to go through a recent TOK subject report (available on the online curriculum centre) with your students and highlight the knowledge questions.

Class discussions around good quality knowledge questions are also essential. Such discussions provide students with the opportunity to demonstrate their TOK knowledge and skills far more effectively and can be used to then develop implications, show a personal perspective and integrate ways of knowing.

**The distinction between shared and personal knowledge**

When discussing knowledge, the TOK subject guide makes a broad distinction between personal and shared knowledge. Both shared and personal knowledge correspond to the forms of the verb “to know”; personal knowledge corresponds to “I know” while shared knowledge corresponds to “we know”. TOK is concerned with both types of knowledge, although more attention might be usefully given to shared knowledge, since this type is predominant in the Diploma Programme.

One of the reasons for the introduction of the distinction between personal and shared knowledge is that it was felt that the previous TOK guide centred too much on the individual. In the 1999 guide, there was an attempt to make the individual the centre of TOK, but it was felt that the pendulum had swung too far in that direction. This was evidenced by the number of essays that saw knowledge as being purely the possession of the individual rather than that of the group, with many essays going no further than lists of personal anecdotes. The distinction between personal and shared knowledge in the new TOK guide redresses the balance between group construction of most human knowledge and the interaction with the individual. Shared knowledge introduces the notion of perspective at the heart of knowledge, as different groups might engender different perspectives. The interaction between shared and personal knowledge allows the question: “What does this (shared knowledge) mean for me?”

**Shared knowledge**

Shared knowledge is assembled by a group of people. Most of the subject disciplines studied in the Diploma Programme are good examples of shared knowledge. For example, chemistry is a vast discipline built up over centuries by a large number of people working together. Individual chemists can contribute to this knowledge base by performing experiments. The results of this research are then written in the form of research papers and presented to peers for review. If there is enough corroboration of the results according to standards set by the chemistry community, they are accepted and become part of the corpus of chemistry knowledge. This knowledge is passed on through technical articles written in specialist chemistry journals.

Let us now turn our attention to the group sharing the knowledge. By participating in the ownership of shared knowledge, an individual belongs to a particular group possessing a particular perspective on the world. The TOK guide states that we belong to many such groups. Examples include:

* family groups
* religious groups
* groups associated with particular academic fields, such as mathematicians
* groups associated with particular views within an academic field, such as neo-classical economists
* groups sharing a particular culture
* groups sharing particular artistic knowledge, such as sculptors
* groups sharing particular interests, such as fishing
* political groups
* national groups
* ethnic groups.

Part of adopting an internationally minded perspective in TOK is therefore acknowledging that membership of a particular group is likely to provide a particular perspective on the world that could be quite different to other groups.

The TOK guide also suggests that shared knowledge is not static. As our methods of inquiry change and develop, so the knowledge they produce changes. These changes might be gradual, but there are occasions when they might be sudden shifts in thinking. These sudden shifts are sometimes described as paradigm shifts.

Examples of these types of sudden shifts in thinking/paradigm shifts include:

* shifts in the visual arts from representational Western art of the 19th century to impressionism to cubism to abstract expressionism
* the paradigm shifts in economics from the classical economics of the 19th and 20th centuries, stressing the rationality of the individual, to the behavioural economics of the late 20th and 21st centuries, stressing the systematic irrationality of the individual
* the paradigm shift from deterministic physics of Newton and Galileo to the indeterminacy of quantum theory
* the paradigm shift from Freudian views of mental processes to the modern cognitive perspective.

**Personal knowledge**

Personal knowledge, on the other hand, is not so easily shared. This might be because it is not so easily put into words. The TOK subject guide stresses that this type of knowledge depends crucially on the experiences of the individual whereas shared knowledge does not.

Examples of personal knowledge include:

* knowledge I gain through practice and habituation, such as the ability to play football, ski, play the piano, dance, paint portraits and so on
* knowledge of my own personal biography through my memory
* knowledge of my feelings and emotions
* knowledge of the world around me gained through my senses
* unique knowledge that I have constructed as a result of a detailed exploration into an aspect of an existing AOK.

Each type of knowledge identified above is personal and is usually not communicated (and if it is, it is not accepted by the community) and so remains in the realm of personal knowledge, not shared knowledge.

**Relationship between shared and personal knowledge**

The TOK subject guide focuses specifically on the interrelationship between shared and personal knowledge. Personal experience, vision and inspiration can contribute to shared knowledge when that personal knowledge is communicated to and accepted by the community. Equally, existing shared knowledge can help the individual answer the questions of “what does it mean for me?” and “what can I personally learn?” and so give the individual a particular perspective on the world.

The TOK subject guide states that individuals can give rise to advances in shared knowledge.

Here are some examples of how personal knowledge can contribute to shared knowledge.

* Individual research can contribute to advances in the natural sciences. Paul Dirac’s personal insight led to his discovery of the equation for the electron. The form of the equation suggested the existence of a particle that was the counterpart of the electron bearing a positive charge. But Dirac’s work had to be validated by the established procedures in theoretical physics first before it was accepted as knowledge by the scientific community.
* Individual artists can contribute to the development of a genre. Steve Reich’s accidental discovery of the effect of two recordings of a violin going out of phase with each other led him to use this technique in his creation of minimal music. This technique is now widely used in many different musical genres.
* Adam Smith’s perceptive realization that the market was a mechanism that, under certain conditions, could transform the self-interest of producers and consumers into a socially optimal allocator of scarce resources became a standard method of analysis in classical economics. His insight may have been intuitive and triggered by his own highly individual style of thinking, but it passed the test of peer scrutiny and is now economic orthodoxy.

The TOK subject guide also states that shared knowledge can influence personal knowledge. After all, this is at least one of the objectives of education—that individual students become familiar with some of the shared knowledge that is on offer in the modern world. The thinking goes, at least in theory, that having access to this knowledge is advantageous in living a life and makes one a better citizen and better able to contribute to the common good.

Here are some examples of shared knowledge influencing personal knowledge.

* Exposure to current artistic trends might influence the thinking and imagination of an individual artist (or musician or novelist).
* Immersion in the biological sciences and medicine might enable one to understand better one's own medical conditions.
* Access to the fundamentals of psychology might allow an individual to develop a deeper understanding of his/her own states of mind.
* A course in ethics or moral theory might allow a student better insight into his/her own ethical and moral outlook.
* Reading a history of one’s own nation might give a deeper understanding of one’s own past.

From an individual point of view, shared knowledge is considered to be a form of authority. Knowledge has authority because it has, in most instances, been validated by the procedures and methods of inquiry of the subject area concerned. The individual without recourse to these same procedures might feel that he or she has to take the authority on trust. An example here might be a patient trusting the judgment of the medical profession. This idea of trusting the authority associated with a body of knowledge might be worth exploring in class.

It is important to get the balance between shared and personal knowledge right in a TOK course. The ideal balance is unlikely to be 50:50. It is quite likely that shared knowledge makes a disproportionate impact on our lives and deserves a proportionately greater coverage in the TOK course.

**Shared knowledge, the areas of knowledge and the knowledge framework**

Shared knowledge is organized into AOKs. AOKs are broad systems of knowledge that possess similar methodologies and subject matter. In the new TOK course, there are eight AOKs identified:

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

Each of these can be broken down into a number of subject disciplines. Teachers should help students explore the AOKs and encourage them to use subject-specific examples if applicable. Some subjects studied by students do not neatly fit into the AOK classification. Students might find it interesting to discuss if and how IB subjects such as social and cultural anthropology, philosophy, world religions, literature and languages fit into the TOK classification of AOKs and how ethical considerations are built into many of the subjects offered by the IB Diploma Programme.

**The knowledge framework**

The knowledge framework is one of the most significant innovations in the new TOK course. One of the important jobs TOK does is to encourage students to compare the methods and subject matter of different AOKs. In the past, the only tool available has been four ways of knowing. It is rather difficult to reduce the complex procedures of, say, the natural sciences, to four rather separate entities: sense perception, reason, emotion and language. Each AOK has specific methods of inquiry that are used to produce knowledge. It is these methods that differ, not the “amounts” of reason, sense perception, emotion and language that are used. Good students have been able to use more sophisticated tools of analysis, however weaker students often resorted to a sort of “quantity theory of WOKs” that tried to account for differences between AOKs by making a judgment about how much of each way of knowing was required in each. What was needed badly was a new more sophisticated tool: a knowledge framework.

The basic idea is simple. Each AOK can be characterized by considering questions related to five different elements. Over the TOK course, the student would compare responses to these questions in different AOKs. This tool gives the possibility of:

* vertical integration—the extraction of abstract elements that different AOKs have in common, allowing us, therefore, to compare and contrast the AOKs in terms of the knowledge framework
* horizontal integration—showing how these elements work together within an area to produce knowledge.

Practically speaking, these questions have a variety of uses in the classroom. They can be used as a framework to explore deeper TOK comparisons. They can be used as a guide to important knowledge questions. Finally, they can be used to generate a stock of examples available for the student to use in exploring these knowledge questions in class as well as in the TOK essay and presentation assessment tasks.

**Discussion questions for each element of the knowledge framework**

**Scope/applications**

This element of the framework attempts to establish the subject matter of the AOK and what sorts of problems motivate its development. It is also concerned with whether there are ethical limits to the sorts of questions that the AOK can consider. Examples of discussion questions for this element of the framework include:

* What is the AOK about?
* What practical problems can be solved through applying this knowledge?
* What makes this AOK important?
* What are the current open questions in this area—important questions which are currently unanswered? (It is useful for the student to be confronted with the idea that AOKs are incomplete and that they are adapting to solve as yet open questions.)
* Are there ethical considerations that limit the scope of inquiry in this AOK? If so, what are they?

**Concepts/language**

This element of the framework explores the role of language in the construction, accumulation and dissemination of knowledge in this area. Examples of discussion questions for this element of the framework include:

* What role does language play in the accumulation of knowledge in this area?
* What is the role of the key concepts and key terms that provide the building blocks for knowledge in this area? (It might be a good idea for students to try to write down the five big ideas in an HL subject that they take. They might want to ask what concepts are required for these ideas to make sense. Then they should try to write down the five big concepts to support these ideas. This exercise helps students understand how complex ideas within an AOK are constructed out of concepts.)
* What metaphors are appropriate to this AOK?
* What is the role of convention in this AOK?

**Methodology**

This element of the framework covers ground which will be very familiar to the experienced TOK teacher. It explores the methods used to produce knowledge in the AOK, and what it is about these methods that ensures reliability or accuracy. It is important that the student does not just describe the methodology of a particular AOK. The student should also dig deeper and ask questions about why these particular methods work. Examples of discussion questions for this element of the framework include:

* What are the methods or procedures used in this AOK, and what is it about these methods that generates knowledge?
* What are the roles of reason, emotion, sense perception, imagination, faith, memory or intuition (the role of language was explored in the previous section) in these procedures?
* What are the assumptions underlying the methods in this AOK?
* What counts as a fact in this AOK?
* What counts as an explanation in this AOK?
* What role do models play in this AOK?

**Historical development**

This element of the framework explores how the current form of an AOK depends on its past. It is an acknowledgment of the fact that knowledge is continually changing according to advances in methodology, interests and the types of problem it is designed to solve. This is the place for reflection on the fact that the AOK might have looked quite different if certain historical “accidents” had not occurred.

This aspect of the framework seems on the surface to require a description of the main outline of the history of a subject. This in itself is a useful activity, of course, but in a TOK context the motivation is more subtle. The way in which we think about the world depends heavily on key moments in the past where our conventional wisdom about the area is formed. To make epistemic progress, it might be necessary to revisit these key moments and ask the question of whether the direction taken then was a good one or whether it led us in a wrong direction. For example, in the 18th and 19th century, big advances were made in economics that led us to consider the subject in terms of an overall cost–benefit analysis. Economics became an exercise in deciding whether certain policy decisions yielded the greatest net benefit (either from the point of view of the consumer, the producer or government). Amartya Sen proposed a different approach where we look at the development of human capabilities instead. Perhaps some of the bigger economic disasters of the last 100 years could have been avoided if we had challenged these initial utilitarian or “profit-driven” ideas.

Examples of discussion questions for this area of the framework include:

* What is the significance of the key points in the historical development of this AOK?
* How has the history of this area led to its current form?
* How would questions in this AOK have been answered 100 years ago? (In the past, the scope, interests and questions asked might have been different. Key terms and concepts might have been different. The methods of inquiry might have been different for a number of reasons, including technological change. This question is also designed as a quarry for examples.)
* Is it conceptually possible that this AOK would look different if history were re-run? (This is a difficult question and might only be accessible to the more capable student.)

**Links to personal knowledge**

This element of the framework makes the important link between personal and shared knowledge mentioned earlier. It is useful to get students thinking about “what does this mean for me personally?” when exploring a particular AOK.

* Why is this area significant to the individual?
* What is the nature of the contribution of individuals to this area?
* What responsibilities rest upon the individual knower by virtue of his or her knowledge in this area? (Perhaps the access to shared knowledge brings personal responsibilities. It is conceivable that a doctor carries extra responsibilities through his or her training and could be obliged to act in situations that require his or her expertise. The doctor might be called upon while off duty to attend to someone requiring assistance after an accident, whereas those without medical training might be exempt.)
* What are the implications of this shared AOK for one's own individual perspective?
* What assumptions underlie the individual's own approach to this knowledge?

**The knowledge framework: an example**

It might be useful to examine possible answers to the framework questions for specific IB subjects (physics in this case). This could be a useful exercise for both TOK students and, in the context of integrating TOK into the Diploma Programme, colleagues in the IB faculty.

**Scope/applications**

**What is the AOK about?**

Physics is about understanding the nature of matter and energy and their interaction.

**What practical problems can be solved through applying this knowledge?**

We can apply this knowledge to understand and control the material world. The technology created through applying physics to real-life problems can be used to try to improve human life.

**What makes this AOK important?**

In some sense, physics underpins the other natural sciences—since they too are concerned with the material world.

**What are the current open questions in this area—important questions that are currently unanswered?**

Examples include:

* how to unify general relativity and quantum theory
* finding and understanding the Higgs boson
* understanding a mysterious force (dark energy) that holds galaxies together
* understanding mysterious matter that is not visible but acts to slow the expansion of the universe.

**Are there ethical considerations that limit the scope of inquiry? If so, what are they?**

There might be limits to the uses to which physics might be put—for example, in the production of weapons. There might be limits on the type of experiment that are deemed to be safe—the production of black holes, for example.

**Concepts/language**

**What role does language play in the accumulation of knowledge in this area?**

Natural language is used for formulating and storing knowledge of physics in books and journals and communicating results at academic conferences. The language of mathematics is central to research in physics—as Galileo said: "Nature’s laws are written in the language of mathematics."

**What is the role of the key concepts and key terms that provide the building blocks for knowledge in this area?**

Key concepts include causation, law of nature, energy, mass, force, field, charge, particle.

**What metaphors are appropriate to this AOK?**

Often macroscopic metaphors are used to understand the microscopic world—so particles can be thought of as balls or as waves and they can have properties such as momentum and spin. Sometimes, a physicist will use metaphors taken from the life of humans, such as: "how does Foucault's pendulum **know** which frame to swing in?", "how does the electron **know** about the other slit being open?" or “how can fundamental particles **feel** the curled up dimensions in string theory?” These metaphors give physicists a sort of visual representation of the phenomena they are studying to aid understanding and to fuel intuition.

**What is the role of convention in this area?**

Conventions are required so that knowledge can be transported from one place/time to another. These might be units such as meter (m), gram (g), volt (V) or conventional definitions of charge (+/-) or what direction current flows in an electrical circuit.

**Methodology**

**What are the methods or procedures used in this area, and what is it about these methods that generates knowledge?**

* Physics uses the hypothetico-deductive method using hypothesis, experiment, observation or measurement, revision of hypothesis. There are areas in physics where a more Baconian approach is used, where data is first accumulated in the hope of finding patterns. Fundamental particle research might be like this.
* Theory is constructed to explain experimental results; mathematical models, simulation, theoretical speculation all play a role.
* Peer review is used to assess new findings.
* New results are also expected to be consistent with previous work.
* Mathematical models are expected to be self-consistent.

**What is the role of WOKs in the methodology of this AOK?**

WOKs are integrated into the methodology of this AOK in a sophisticated and invisible way. In this case, it can be seen that the scientific method requires intuition and creativity to produce hypotheses and reason to ensure its consistency with current understandings. The hypothesis would be formulated using the conceptual resources of physics and so would require language. Experiments would yield observations and measurements that to be available to the experimenter would require some element of sense perception.

No doubt students will examine the role of emotion as a personal motivator for the experimenter in the first place and will distrust those experimenters who let their emotions affect their judgments. But be careful! The problem with this type of analysis is that it is at the level of the individual (experimenter) while shared knowledge is happening in the space of collective understanding, collective knowledge and collective intentions. Groups of people on the whole do not have single emotions, sense perceptions or reasons. So WOKs often impact shared knowledge through their impact on individuals (personal knowledge) and their contribution to shared knowledge.

**What are the assumptions underlying these methods?**

Examples include:

* the material world is rationally comprehensible
* every event has a cause (although this has to be revised slightly in the light of quantum indeterminacy)
* what happens in a laboratory on earth is somehow typical of the rest of the universe
* nature does not change radically from one day to the next.

**What counts as a fact in this AOK?**

Experimental results and well-established theories count as facts.

**What counts as an explanation in this AOK?**

An explanation reduces complex, poorly understood phenomena to simple, well-understood concepts.

**What role do models play in this AOK?**

Almost all laws of physics are model-like in the sense that they apply to ideal situations where all variables except one are controllable.

**What ethical thinking constrains the methods used to gain knowledge?**

Some experiments might not be permitted because of their dangerous effects—for example, some people were worried about the Large Hadron Collider (LHC) experiments in CERN because of the possibility that they might produce small black holes that would have a disastrous effect on our planet.

**Historical development**

**What is the significance of the key points in the historical development of this AOK?**

* Newton and Galileo gave us a view of the universe as being subject to deep laws of nature that are formulated mathematically.
* Maxwell's work showed that electromagnetic waves do not have to be “in” anything; they can exist in a vacuum—something that was feared in the early history of the subject.
* Developments in quantum theory challenge the assumption of strict deterministic laws and replace it by statistical laws. We should worry a little bit about what we mean by a “statistical law”.

**How has the history of this area led to its current form?**

The units that we use today have a history. In some sense they are arbitrary. Similarly the concepts that we think of as primitive—say, energy, charge and force—are primitive precisely because of the history of physics. There are equivalent formulations of the same physics using different primitive concepts.

**Links to personal knowledge**

**Why is this area significant to the individual?**

The immediate reaction to this question could be a negative one, in the sense that physics makes sense of human beings as material things but does not say anything about human consciousness. So the area is significant because it seems to miss out on rather a lot of human experience.

**What is the nature of the contribution of individuals to this area?**

Many individuals have contributed over the last 400 years. Newton, Hooke, Galileo, Maxwell, Einstein, Planck, Schrödinger, Dirac, Hubble, Bohr. Most of their contributions have been the ability to create clear theoretical understandings, underwritten by mathematical theory, explaining complex physical phenomena.

**What responsibilities rest upon the individual knower by virtue of his or her knowledge in this area?**

The individual physicist has to take some responsibility for the consequences of his or her actions. This is particularly true when it comes to the development of the atomic bomb or other military applications of physics (see Richard Feynman’s excellent autobiographical account of the experiments at Los Alamos in *Surely You’re Joking, Mr. Feynman*).

**What are the implications of this shared AOK for one's own individual perspective?**

Understanding the vastness of the universe could produce a perspective in which we see ourselves as wholly insignificant.

**The relationship between ways of knowing and areas of knowledge**

WOKs are a means by which we know things. All AOKs employ the various WOKs for knowledge production. Thus, the WOKs transcend the boundaries of all topics within the course. Various WOKs must be studied therefore in any TOK course, but they should not be treated as ends in themselves; rather, they should be studied in terms of their relationship to how individuals come to know things (personal knowledge) and also in terms of how communities, nations and humankind come to knowledge (shared knowledge).

In the previous TOK course, WOKs were being dealt with by many students (and by implication, their teachers) in isolation and in the abstract, rather than being seen as working together and being embedded in the AOKs. The restriction to just four ways of knowing in the previous guide also prevented students considering methods of inquiry that drew upon intuition, imagination, creativity and so on. The increase of the number of WOKs available for study in the new course reduces the emphasis on the traditional four and creates space for discussions about ways of knowing such as imagination and intuition following the direction of recent advances in evolutionary psychology and neuroscience.

When discussing WOKs and, indeed, whenever students are investigating personal knowledge, it is important to emphasize that students are not being asked to consider knowledge-making solely or primarily in terms of their own personal, idiosyncratic and non-academic experience. While it is helpful for TOK students to understand how they come to know that the grass (at least healthy grass) is green, why they individually prefer chocolate ice cream to vanilla or cricket to soccer because that understanding reveals how the WOKs work in tandem to provide our knowledge, it is imperative that that understanding forms the basis for learning about knowledge-making in a wider context. An effective TOK class will make sophisticated connections between the ways that individuals use the WOKs and the ways in which those WOKs are used in the context of the AOKs.

**What is the nature of the way of knowing?**

This question helps students to consider just what we mean when we talk about sense perception, imagination, intuition, reason or the other WOKs, so that they can distinguish one from the other. One way to do this is to consider the WOKs as physical processes. Some teachers are comfortable talking about the WOKs as biological processes, and that approach can help students understand both how the physical nature of each WOK influences what we can know and how that physical nature shapes the ways in which the WOKs interact. Teachers who are less familiar with the biological aspects of the various WOKs might prefer to consider the nature of the WOKs from the perspective of the effects of WOKs on our understanding of the world.

The reason for considering the WOKs at all is so that we begin to develop some answers to the question of how they function to help us make knowledge. In considering the nature of imagination, for example, a teacher might prefer not to focus on the physiological processes of imagination, but rather on the practical and fascinating fact that human beings are capable of breaking their experiences down into separate attributes and then recombining those attributes into new configurations that have never yet been encountered, by that individual, or even, perhaps, by any human being. None of us has any trouble, for example, imagining a violin-playing, roller-skating, purple parakeet sporting mirrored sunglasses, although none of us has ever encountered one. Recognizing that we have such a capacity can help students understand a great deal about the role of imagination in making knowledge, whether they know how that process works in the brain or not. A teacher with sufficient time in the curriculum might, of course, wish to consider both the physical aspects of the WOKs and their practical effects.

**How does this way of knowing work in conjunction with other ways of knowing?**

We do not, in fact, use the WOKs in isolation from each other. As the guide points out, just the simple act of noticing the colour of a blue table requires multiple WOKs: sense perception to take in the light waves and interpret them, reason to provide the cognitive framework to understand that a particular set of features constitutes a table and that a table is something which can have a colour, and language to name both the object and its colour. Memory also comes into play, not only for retaining the word “blue,” but for checking the current sensory impression against past experiences of tables in order to fit the current experience into the “table” paradigm and assign it the name. Emotion, too, might come into play if, for example, an individual knower happened to spend her childhood eating at a blue kitchen table. The sight of a blue table might then activate a set of particularly positive experiences so that this learner’s knowledge of this particular table will be quite different from that of another learner who does not like the colour blue.

**How does this way of knowing function in the context of each of the areas of knowledge?**

One way to consider the role of the WOKs in shared knowledge is to realize that practitioners in each of the AOKs have systematized the process of evaluating the efficacy of the WOKs for generating knowledge in that particular area, and they have developed both technologies and formal procedures for maximizing the strengths of each WOK and minimizing the potential limitations. In the natural sciences, for example, numerous technologies have been invented specifically to expand our access to empirical data. We can’t see electrons—not even with advanced microscopes—so physicists have developed colliders that allow them to observe the effects of electrons instead. Historians cannot observe the daily lives of, say, the Mayan Indians, so they employ the methods of natural scientists and archeologists to gather, date and analyse objects that remain from that civilization.

The series of questions on the diagrams, then, suggests specific ways in which students can focus their attention on these formal mechanisms so that they begin to understand that one of the underlying values of shared knowledge-making is the belief that we do not have to see ourselves as captive to our physical, emotional or rational nature. We do not have to rely on faulty memory, emotional bias or an overactive imagination that sees patterns where none exist. We can check the logic of our reasoning, use our passion as a motivational force and an aid to conveying our shared knowledge to others, and count on our inductive conclusions so long as we are willing to consider them provisional and change them if evidence arises which calls them into question.

**A brief list of resources**

There is an extensive database of possible resources for TOK elsewhere in the TSM, but the following few works are excellent resources for particular aspects of the nature of the WOKs.

**For biological processes of the ways of knowing**

Crystal, D. 2005. *How Language Works*. London, UK. Penguin.

Damasio, A. 1994. *Descartes’ Error: Emotion, Reason, and the Human Brain*. New York, USA. Putnam.

Shermer, M. *The Pattern Behind Self-Deception*. Video on TED: Ideas Worth Spreading at TED.com. Accessed 5 March 2012. http://www.ted.com/talks/lang/en/michael\_shermer\_the\_pattern\_behind\_self\_deception.html.

**For the effect of the ways of knowing on our understanding**

Chabris, CF and Simons, DJ. 2010. *The Invisible Gorilla: and Other Ways Our Intuitions Deceive Us*. New York, USA. Crown.

Gilbert, DT. 2007. *Stumbling on Happiness*. First edition. New York, USA. Vintage books.

Schulz, K. 2010. *Being Wrong: Adventures in the Margin of Error*. New York, USA. Ecco.

Shermer, M. 2011. *The Believing Brain: From Ghosts and Gods to Politics and Conspiracies—How We Construct Beliefs and Reinforce Them as Truths*. New York, USA. Times Books.

**For the interactions between the ways of knowing**

*Choice*. Radiolab. 17 November 2008. Accessed 5 March 2012. http://www.radiolab.org/2008/nov/17/.

Gladwell, M. 2005. *Blink: the Power of Thinking Without Thinking*. New York, USA. Little, Brown and Co.