

sidestepping the actual role of the historian. Ways of knowing tend to be forced into the analysis in places where they do not and cannot enlighten. Sometimes they are mentioned seemingly just for the sake of making sure they are in the essay even though they provide no insight at all – “it was observed by sense perception”, “using memory, this is all I know”, “with the help of reason I reached this conclusion”, etc.

**The most recent subject guide gave pride of place to a set of knowledge frameworks that were designed to provide appropriate tools for TOK analysis (see TOK subject guide, page 28 onwards). While ways of knowing are mentioned within these frameworks (particularly in connection with methodologies), the promotion of the frameworks was a response to some of the problems described above that stem from the limitations in the competence of ways of knowing to achieve successful TOK analysis on their own. Teachers are strongly encouraged to consider shaping their treatment of various parts of the course through the use of the framework tools. While the subject guide states that the knowledge framework is not compulsory, neither are the ways of knowing required to form the foundation for addressing many of the prescribed titles.**

#### Key Points

- The subject guide makes it clear that ways of knowing almost always operate together, and this should be reflected in the approach taken to them in essays
- The great majority of current prescribed titles invite candidates to select and indicate the areas of knowledge to be explored in the essay, but, as a rule, no similar imperative applies to ways of knowing in these titles
- Offering an explicit selection of ways of knowing at the start of the essay tends to undermine the claim above that they work together

## The candidate and the subject professional as knowers

As (a) TOK is a course about knowledge and (b) knowledge is a human construct, it is important to be clear about the relation between the two in TOK work. There is a place in TOK analysis for discussion of how knowledge is produced (often by expert practitioners in subject disciplines) but also by lay individuals including TOK candidates, and also for discussion of how existing knowledge is consumed and distributed. Naturally, the dominant bulk of the academic life experience of school students will consist of the latter, but the balance between these two relationships with knowledge demanded by each prescribed title is often indicated by their exact wording.

Phrases such as “the production of knowledge” or “knowledge... develops” (title 2) give clear cues, whereas “the pursuit of knowledge” (title 1) or “in gaining knowledge” (title 3) or “in knowledge” (title 6) or “the acquisition of knowledge” allow for more latitude. However, TOK essays can succeed only by acknowledging and exploring how the body of human knowledge is produced and extended and thus move beyond an exclusively individual perspective. One reason why the distinction between shared knowledge and personal knowledge was introduced was to draw attention to the need for balance in this respect, even though it does not map exactly onto the difference between knowledge production and consumption.

**Key Points**

- Candidates are advised to look carefully at the wording of prescribed titles in order to ascertain what kind of engagement with knowledge is being elicited
- Wherever possible, clear distinctions should be made between the processes involved in the production of knowledge and those involved in the consumption of knowledge

**Aspects of essay content**

As with previous sessions, a wide variety of examples was on offer in essays, but a preponderance of a particular group of them drew some concerns among examiners. Despite its length, the following is naturally only a subset.

1. Serendipitous discovery of penicillin by Alexander Fleming
2. Mark Rothko and environmental influences on his work
3. String theory and the role of evidence in the sciences
4. Margaret Mead's perspective during fieldwork in Samoa
5. The human aspects of the story of the discovery of DNA and of its structure from Friedrich Miescher to James Watson, Francis Crick and Rosalind Franklin
6. Bloodletting as an example of an obsolete practice in medical science
7. The value of the Enigma code and the work of Alan Turing
8. Alchemy as the necessary precursor to modern chemistry
9. Pablo Picasso and Guernica
10. Vincent van Gogh and Starry Night
11. Leonardo da Vinci, the Mona Lisa and Vitruvian Man
12. Isaac Newton and the compatibility of his scientific achievements and his religious orientation
13. Persistence of "anti-vaxxers" despite the exposure of Andrew Wakefield's claims in relation to MMR vaccine as fraudulent
14. The applications of imaginary numbers
15. Ludwig van Beethoven's deafness and reliance on "feeling"
16. Rounding of numbers (eg pi) as examples of simplification and inaccuracy in mathematics
17. Polynomials, factorisation and complexity
18. Music therapy as an application of knowledge in the arts
19. Different notations and ways of doing differentiation from Isaac Newton and Gottfried Leibniz
20. Thomas Edison and the invention of the light bulb
21. The Hiroshima bomb versus nuclear fission reactors with respect to the value of knowledge
22. Work in number theory by Pythagoras, Pierre de Fermat and Andrew Wiles
23. Membrane structure from Davson/Danielli to Singer/Nicholson and the fluid mosaic model
24. Galileo Galilei's house arrest and Pope John Paul II's admission of error in 1992

25. Friedrich Wöhler's blow to vitalism with the non-biological synthesis of urea
26. Atomic theories from John Dalton to JJ Thompson to Ernest Rutherford to Niels Bohr to Erwin Schrödinger
27. Elizabeth Loftus and John Palmer on language and eye witnesses
28. Francesco Redi, Louis Pasteur and the disproof of spontaneous generation
29. Alfred Wegener and continental drift
30. Lera Boroditsky's article on Australian aboriginal orientation
31. Caloric vs kinetic theory with respect to "natural selection" in scientific knowledge
32. Leonhard Euler's equation allegedly having value without application
33. Development of heliocentrism from Aristarchus to Copernicus
34. Thalidomide prescribed for morning sickness and leprosy
35. The outcomes of the work of Fritz Haber for fertilizer and explosives
36. The Riemann hypothesis, large primes and Internet security
37. The Treaty of Versailles and the subsequent rise of Nazism in Germany
38. George Orwell's perspective as presented in Animal Farm
39. Thomas Young's double-slit experiment and wave-particle duality in physics
40. The ethics of Edward Jenner's work on smallpox and vaccination
41. August Kekulé's dream and the structure of benzene
42. Antonio Damasio and somatic marker theory
43. Fritz Fischer and the alleged causes of WWI
44. Occam's razor with respect to Albert Einstein's special relativity and Hendrik Lorentz's ether
45. Gregor Mendel and overly neat experimental results for segregation and independent assortment (also Robert Millikan and determination of the electric charge on the electron)
46. Jackson Pollock's art and the use of WOKs
47. The Amish and rejection of modern technology
48. The Phillips curve and transient accuracy in economics
49. Lock-and-key and induced fit models of enzyme action
50. Spherical and hyperbolic geometries as perspectives in mathematics
51. Confirmation bias and persistent error in the accepted human chromosome number
52. CERN and the Higgs boson as applied knowledge
53. Standard rival interpretations of the Cold War: traditional, revisionist, post-revisionist
54. Albert Einstein and the cosmological constant
55. Edwin Hubble and expansion of the universe
56. Ignaz Semmelweis and childbed fever
57. Conventional current and electron flow
58. The Nanjing massacre and perspectives

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| <p>59. Alfred Adler and schemas in psychology as the basis for perspectives</p> <p>60. Biston betularia and industrial melanism as an example of natural selection</p> <p>61. Detection of gravitational waves in accordance with predictions from Einstein's theory of general relativity</p> <p>62. Feynman diagrams and quantum electrodynamics with respect to simplicity (!) and understanding</p> | <p>63. Physiology from Galen to the discovery of blood circulation by William Harvey</p> <p>64. The complexity of the chemistry of photosynthesis as presented at various stages of education</p> <p>65. The patient's "perspective" in connection with the use of placebos in medical testing</p> <p>66. Heinrich Hertz and the subsequent application of radio waves</p> |
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From this list, a number of rough distinctions can be made.

Some examples (e.g. 9, 10, 20, 41, 58) appeared with great regularity but, with some additional thought, could have been substituted by others that would function at least equally effectively, and perhaps have offered additional insights.

Some (e.g. 1, 15, 18, 27, 30) have "gone viral" and could be found in many essays – even in the service of different titles. Examples of this type tend to gain momentum, persist over a few sessions and then recede.

Some examples (e.g. 25, 26) stem directly from candidate experience in other DP courses, and as such are to be welcomed as evidence for a primary aim of TOK in action. However, there may be other such points of contact across the diploma that could also be exploited. Candidates often included their own experiences with extended essays and internally assessed tasks, and this is to be encouraged as long as they are described in enough detail to illustrate the claims at large.

Many of the examples above do have much potential when they have been mastered by candidates and applied in situations where they support or illustrate the exact claims being made about knowledge. Unfortunately, this is often not the case, and they are sometimes treated with a laziness that can border on disrespect.

Examiners are aware that the ideal of the TOK essay as the culmination of the student's personal adventure to date in knowledge is perhaps unrealistic for many candidates on grounds of the limits of personal experience or motivation, but it must be pointed out that the constraints imposed by these factors can be exacerbated by the temptation to rely on external sources designed specifically to "help" with the task. As there is a finite quantity of such material available, shared patterns of essay structure and content across schools often become evident to examiners. If a candidate's first move is to search the internet for material that responds directly to a prescribed title, there is no way back from the "contamination" of thought that has occurred, and the short-circuiting of the process of internalization often leads to correspondingly poor work. Teachers are strongly urged to lead their candidates to formulate a personal and independent response to a title before allowing the wider world into the task that lies before them.