

Lesson 5: The Power of Names

Context

Names are often considered to be the most straightforward aspect of language—words simply as labels for things. Because of the apparent simplicity of names, this is a good starting point for the investigation of the nature of language.

This lesson considers examples of names for places and people in order to show how the word-as-label model is inadequate in itself—how even apparently simple names embody whole ranges of connotation, abstraction and generalization, and thus illustrate wider aspects of the phenomenon of language as a whole.

The lesson is effective as an introduction to the work on language and thought, because it raises many points which can be addressed later.

Aims

- To investigate the nature and power of names in language and their levels of meaning.
- To consider the cultural and historical context of language.

Class Management

Students will need access to atlases, both present day and historical. Other reference sources of African history would also be useful. It may be necessary for students to investigate the history and meanings of their own names in advance.

This lesson lends itself to group work for the geographical part, and individual work for the collection of personal names.

Timing will depend on whether the gathering of all the information is to be a class activity or a preparatory one (with students bringing the results of their research to the lesson). Either is feasible. The structure of the lesson is open and any part of the content outlined may be sufficient to stimulate the discussion.

Focus Activity

Consider a current political map of Africa. Consult a historical atlas and note changes in the names of countries, particularly since the start of the European colonialist period. Try also to discover the origins of some current names for African countries.

Make a list of the personal names of members of the class. Exchange information with other class members about their personal names. Do any of these names have known meanings, other than simply referring to the person in question?

Amongst the Akans of Ghana, each individual receives a name (in addition to others) which corresponds to the day of the week on which he/she was born (see chart below). Does anything similar happen in other parts of the world?

Discussion Questions

Teacher Notes

By conducting this lesson with a minimum of technical vocabulary, the students can begin to discover for themselves the intricacies and complexities of language.

1 Examples of changes might be:

Rhodesia to Zimbabwe
Gold Coast to Ghana
Upper Volta to Burkina Faso
Nyasaland to Malawi
Dahomey to Benin

Many present-day names refer to historical territories quite different from those in existence now. Often, they were great empires, such as Ghana, Benin, Mali.

Some present day names have quite simple derivations:

Liberia, meaning freedom
Sierra Leone, meaning land of lions (Portuguese meaning thunder as lions roar)
Tanzania is a combination of Tanganyika and Zanzibar.

- 2 In Africa biblical names such as Solomon, Moses and Emmanuel are common. In Latin America, Jesus, María and Angelo are often chosen.
 - 3 Compare the Akan practice of giving a baby a name corresponding to the day of the week, with the *Monday's Child* rhyme in English (see student handout).
- If names of countries are simply convenient ways of referring to particular geographical areas, then why have the names changed? List some specific examples to illustrate your answers.
 - Why is it perhaps particularly pertinent to look at African names in this connection? How are history and language intertwined?
 - What names denote may change historically (eg Germany, Yugoslavia), but what they connote also changes in other, not necessarily related, ways. For example, a person's name may have some meaning other than the trivial sense of being a label, but what is the relationship between that name and the person concerned?
 - Different cultures employ different names. To what extent do they correspond to one another in meaning?
 - Names refer to people and places we can point to, but they must also refer to images of these people and places in our minds. What are the different layers of meaning in names? Try to identify them, separating the different levels. Can we distinguish between the information-bearing and affective aspects of connotation?
 - If more than one individual shares the same name, what does that mean? Is this the same as the use of the word table, for instance?
 - Personal names go in and out of fashion. How, if at all, can this be related to their meanings? How are language and taste related?
 - To what extent is a personal name a reflection of, for example, religion, social class, nationality?

Lesson 6: Language and Symbolism

Context

This lesson is useful in raising distinctions between the strengths of body language and the strengths of language symbolism in communication. It can also help make distinctions between signs and symbols. It includes a game which leads to discussion on the capacity of language to communicate what physical gestures cannot.

Aims

- To examine the symbolic nature of language.
- To investigate the use of language for abstraction through an introductory game of charades.

Class Management

This lesson takes 40 to 50 minutes, though the discussion questions can occupy more time. The class is divided into small groups to play the game first, and then brought back together for discussion.

Cards such as those which follow must be prepared in advance. They are only suggestions. Those written by teachers referring to situations to which their own students can relate would be more effective. You will need one pair of cards per group.

Have all the card As in one colour, and all the card Bs in another colour. You should mark each card clearly on the back as A1, B1, A2, B2, and so on, so that it is possible to move cards from group to group for a second round of the game and still keep track of what each group is doing.

Focus Activity

Divide the class into groups of four to six students and disperse them in the classroom. Then divide each group in half.

Give the first half of the group a card A, on which is written a description of a situation which they must act out for the second half—without using any words. The second half of the group must guess as accurately as possible what is being communicated, with the goal of being able to reproduce verbally the description on the card without having seen it.

Then give the second half of the group the equivalent card B, for them to act out in turn.

The TOK twist to this game of charades is that the cards **are in pairs**. The A cards describe concrete objects, physical actions, and emotions, all of which are fairly easy to enact. The B cards shift to greater level of detail, abstract ideas, connection in time, space, or consequence, and other relationships such as addition, contrast, and exception.

Be prepared for indignant wails from students on first reading a card B.

Student Handout

CARD A	CARD B
<p>You are in love with someone, but all your efforts to attract his/her attention fail, and you are left with a broken heart.</p>	<p>You are in love with someone, but refuse to take your emotions seriously, because you regard love as a destructive force which can undermine good judgment and lead couples into hasty and ill-fated marriages which can end only in divorce.</p>
<p>You find mathematics very difficult. You have studied hard for a test, but your mark is still bad and you feel extremely discouraged.</p>	<p>Although your marks in mathematics are not very good, you enjoy the challenge of studying mathematics, because you find the intellectual rigour satisfying and consider the subject to be fundamental to success in other areas such as economics or engineering.</p>
<p>A friend comes to you, very excited, because he/she has just won a huge prize in a lottery and wants you to come along and celebrate.</p>	<p>A friend comes to you, very excited, because he/she has just been hired to write a feature article for the regional newspaper on a project on which he/she will be assisting an art expert who restores old paintings and establishes their authenticity.</p>
<p>You have just received a phone call from your mother who tells you that the family pet dog has died.</p>	<p>You have just received a phone call from your mother who tells you that your brother has just won a huge scholarship to study astrophysics at a top university in England, beginning next autumn.</p>
<p>You have just had a serious conversation with your parents about whether you should go to university after your Diploma Programme studies.</p>	<p>You have just had a serious conversation with your parents about going to university after your Diploma Programme studies, or whether you should work and save for a year first in order not to build up a debt from the very beginning of what will probably be several years of higher education.</p>

Discussion Questions

What, on the cards, was easy to act out? What was difficult? Why? Are there some things for which body gestures and expressions are more effective than words? Are there some things for which words are more effective in communication?

What is a symbol? What is the relationship between a word and that to which it refers?

Is body language natural, or is it learned? How might body language vary across cultures—in the extent to which it is used for communication, and in the significance given to gestures? Possible examples for discussion are: one's sense of personal space, the use of eye contact, gestures for yes and no, for come here, for flirtation, for aggression or insult. How might the accompanying body language affect the meaning of utterances?

Is sign language for the deaf more accurately considered to be body language or a symbolic system?

What effect does the existence of our symbol system of language have on knowledge?

Links to Other Areas of TOK

- How does language compare with other symbolic forms of communication such as painting, dance, music and mathematics? Would it be possible to place all these forms in a range or spectrum according to any of the following qualities: precise–evocative; rational–emotional; representational–abstract; specific–general?
- Is knowledge restricted to claims made in language? Can a look or gesture communicate knowledge?
- How does the anthropologist or other practitioner of the human sciences gain knowledge of an individual or culture? How might the context of body language be significant in methods of observation and interview?

From Other Times and Places

A discussion of the variability of body language around the world, both in its acceptability and its specific gestures, places language in its cultural context.

References

- Axtell, RE (ed.), *Do's and Taboos Around the World*, (1993) John Wiley and Sons, ISBN 0471595284
- Farb, P, *Word Play: What Happens When People Talk*, (1993) Vintage Books, ISBN 0679734082

Lesson 10: Thinking Logically?

Context

This lesson can be done after a consideration of the nature of reasoning, or before looking at fallacies. It links into work on scientific methodology.

Aim

- To investigate the extent to which logical thinking is influenced by the subject matter.

Class Management

This lesson can be completed in 40 minutes, or longer if necessary.

In advance of the lesson, photocopy the two Logic Tests overleaf. You will need one copy of the two tests for each student. Students may be given the two problems at the same time (on the same sheet of paper), or one following the other.

Ask the students to work out and write down their answers without collaborating, and then to report them back to the whole class. Compile a list of votes for each card on the blackboard.

Overwhelmingly, students fail to identify the 7 as one of the correct responses in Logic Test 1. Explain to the class why 7 is correct (this card is capable of falsifying the rule) and why 2 is wrong (this card is irrelevant to the rule).

Students normally identify the correct answers for Logic Test 2.

Discussion can then proceed as to why, given that the two problems are formally identical, one is so much easier to solve correctly than the other. Reference can be made to the importance of form and content in logical reasoning, and how this may affect the building of knowledge.

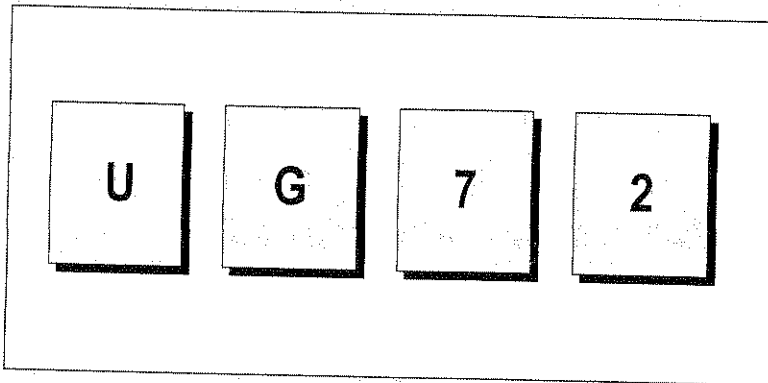
Focus Activity

Student Handout

Logic Test 1

You are presented with the following rule:
Every card with a vowel on one side has an even number on the reverse side.

These are the cards.

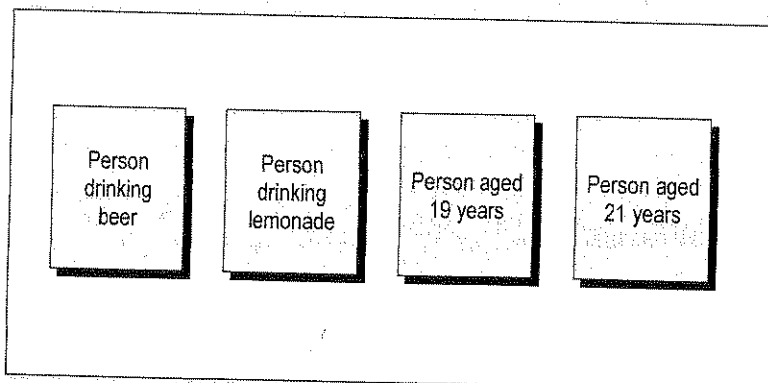


Which two cards should be turned over in order to find out if this rule is indeed the case?

Logic Test 2

You are a barperson in a night-club. The club has the following rule:
Every person drinking alcohol must be over 20 years of age.

These are the four situations.



Which two situations should be investigated?

Discussion Questions

- Compare your answers for the two examples given. Justify your choices.
- The two examples are formally identical (that is, their underlying structure is the same), yet many people do not choose the same answers. Why not?
- Might this difference reflect something about human thinking in general? Why is it easier to spot the correct answers in the second example?
- One view of the nature of science is that scientific activity is primarily about generating hypotheses and then trying to falsify them. What might these examples have to do with this?

Links to Other Areas of TOK

- What is fallacious reasoning? Why are fallacies so often persuasive and plausible?
- Why is mathematics, as a school subject, so difficult for many students at the advanced levels?

From Other Times and Places

- In what way, if any, might good reasons vary across cultures?
- Is there knowledge beyond the categories of logic? If so, what are its foundations?
- If arguments in ordinary life are not formally set out so as to exhibit clearly their formal structure of premises and conclusions, how can this structure be identified?

Quotations

The paradox is now fully established that the utmost abstractions are the true weapon with which to control our thought of concrete fact.

A N Whitehead

If a man can play the true logician, and have as well judgement as invention, he may do great matters.

Francis Bacon

It is not therefore the object of logic to determine whether conclusions be true or false; but whether what are asserted to be conclusions are conclusions.

A de Morgan

Lesson 11: Routes of Mathematical Knowledge

Context

There is a tendency in many TOK discussions to perceive the rational as Western and the non-rational as belonging to the non-Western.

Most students tend to think of knowledge systems as being fully formed and sprung upon them. This lesson allows the student to explore the development of a system of knowledge.

Students also assume that knowledge systems are pure, and that they have a life of their own. As assessment questions sometimes ask students if knowledge can be affected by culture or other influences, this lesson reveals that knowledge systems like mathematics and logic can respond to political, economic and cultural influences, by offering the dual perspectives of Asian and European politics.

Aims

- To follow the development of both Asian and European frameworks for mathematical knowledge, and to explore the possibility of a common heritage.
- To reveal the stages of formation in a system of knowledge.
- To challenge the assumption that rationalism is a Western product.

Class Management

This activity might involve a visit to the library, followed by the return to the classroom. About half an hour could be spent creating a timeline and making a web of exchanges of knowledge. The rest of the lesson or part of the next can be spent in discussion of the questions.

Focus Activity

Step One

Give each student an index card with one of the following research topics on it. Send the students to the library to research (date and place) their topic for about 20 minutes. An encyclopaedia will be the best source of reference as there is insufficient time for extensive research.

Suggested Research Items

- Abacus
- Decimal system
- Ramanujan
- Probability
- Calculus
- Pythagoras' Theorem
- Omar Khayyam
- Chaos Theory
- Geometry
- Zero
- Algebra
- Euclid
- Algorithm
- Trigonometry
- Infinity

Step Two

Each student should describe his/her findings and place the topic on a timeline on the board—so creating the periods of knowledge development and points of transference.

Step Three

Examine the completed timeline. Discuss the origins of each topic and any interdevelopment.

Discussion Questions

Conventional division of the mathematical history timeline separates into periods: earliest times to ancient Babylonia and Egypt, the Greek contribution, the Far-Eastern and Semitic, and the European from the Renaissance onwards.

- 1 Can mathematical knowledge be called the most international of all systems of knowledge?
- 2 Does Western mathematical theory diverge from Eastern mathematical theory? Explain your answer.
- 3 The development of mathematical knowledge is often illustrated by a tree diagram (that is, roots labelled as arithmetic, the trunk labelled as calculus). Mathematical scholars often select the banyan tree as the best tree for such an illustration. Why might this be so?
- 4 Why is the vast Asian learning in mathematics so little known in the rest of the world?
- 5 Asian students are expected to do well in mathematics. What is the basis of this expectation?
- 6 What assumptions are challenged by the brief research the students did?
- 7 Is mathematics invented or discovered?

Links to Other Areas of TOK

- What is the role of inductive and deductive reasoning in mathematical knowledge?
 - What is the connection between mathematics and logic?
 - How do you explain the impact of culture or politics on mathematical knowledge?
 - What is mathematical truth?
 - Are the conclusions of mathematics concerned with truth or validity?
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Lesson 12: Is Math for Real?

(a TOK Quiz for Mathematical Knowledge)

Context

This lesson serves as an introduction to a unit on mathematical knowledge. It could be presented at any time during the TOK course, but is best given after a unit on reasoning.

Aims

- To reflect on the nature and formation of mathematical knowledge.
- To develop arguments for and against various issues surrounding the formation of mathematical knowledge.

Class Management

The lesson requires one 40–60 minute period for a class of 12 to 20 students, divided into groups of three. Each member of the group should receive a copy of the quiz and be allowed 15–20 minutes to complete it and discuss the how and why of their answers within the group.

Members of each group are encouraged to compare and contrast their answers with those of other members in the group.

At least 20 minutes should be allowed for class discussion. One can normally expect a fair amount of class interaction with arguments and counter-arguments being presented. Because some questions tend to result in rather predictable answers, the teacher, as the discussion leader, must be prepared with supporting examples in mind.

Focus Activity

The following two pages comprise the quiz. A copy should be given to each student.

Student Handout

A TOK Quiz for Mathematical Knowledge

Circle the letter(s) of the appropriate answer(s) for each of the following. Discuss these answers with the people in your group and prepare to give supporting arguments for your selections.

- 1 Mathematics is a subject about:
 - A logical thinking
 - B illogical thinking
 - C things that exist in nature
 - D things that do not really exist at all
 - E things that are certain
 - F things that are not certain.

- 2 Problems in mathematics can best be solved by using:
 - A clever tricks
 - B experiments
 - C computers
 - D graphic calculators
 - E trial and error
 - F investigations
 - G discussion
 - H the answers in the back of the textbook.

- 3 Mathematics is a subject that should be studied by:
 - A people who are interested in it
 - B engineers and other people who want to apply it
 - C people who are challenged by it
 - D people who want to become better thinkers
 - E people who are intrigued by its aesthetic qualities
 - F people who want to become better artists
 - G people who want to improve their overall academic performance
 - H people who want to improve their college entrance exams
 - I all Diploma Programme candidates
 - J people who are poor at it.

4 Which of the following best describes mathematics?

- A a body of knowledge
- B a practical tool
- C a cornerstone of philosophy
- D the perfection of the logical method
- E the key to understanding nature
- F an intellectual game
- G an aesthetic experience.

5 One plus one is:

- A always equal to two
- B sometimes equal to two
- C never equal to two
- D too philosophical to think about.

6 Parallel lines:

- 6 never intersect
- 7 always intersect
- 8 do not exist.

7 Which of the following quotations best captures the essence of mathematics?

- A *A mathematician is a blind man in a dark room looking for a black cat which isn't there.*
Charles Darwin
- B *Pure math is a game. It's fun to play. We play it for its own sake. It's more fun than applying it. Most of the math that I teach is never used by anyone. Ever.*
Ted Williams, Prep School Mathematics Teacher
- C *If you ask your mother for one fried egg for breakfast and she gives you two fried eggs and you eat both of them, who is better in arithmetic, you or your mother?*
Carl Sandburg
- D *Mathematics is a game played according to certain simple rules with meaningless marks on paper.*
David Hilbert

Discussion Questions

Comments for the teacher's use:

- 1 Do any mathematical statements seem illogical at first glance? Why, for example, do we say $\frac{3}{4} \div \frac{1}{2} = \frac{3}{4} \times 2$?

It will be difficult to associate all aspects of mathematics with natural phenomena. Try finding $\sqrt{-1} = i$ in a natural setting.

Mathematics is not the total solution that some people claim it to be. It has been found (Gödel's Incompleteness Theorem) that any system of logic (mathematics included) will by its very nature be incomplete. That is to say, certain questions will be unanswerable. Consider the following paradox:

If the Barber of Seville shaves all men in Seville who do not shave themselves, then who shaves the Barber?

Can we apply this question to the formation of mathematical knowledge? For example, is mathematical knowledge formed in some experimental manner?

- 2 What is the basis of the formation of mathematical knowledge?

- 3–4 Who is interested in mathematical knowledge and why?

May mathematicians consider theorems like Euclid's or other mathematical proofs to be works of art?

Why must all Diploma Programme candidates take mathematics? Perhaps justification comes with the choice of answers for question 4, most of which come from a description of mathematics by Morris Kline.

- 5 Is A the obvious answer here?

After all, Bertrand Russell took 362 pages in *Principia Mathematica* to prove that $1 + 1 = 2$. And we can certainly think of examples of nature from the very simple to the complex where the meaning of 'to add' does not function in the usual mathematical sense. Consider, for example: What is the sum of one drop of water with another drop of water? This example may seem trivial, but it must not be quickly dismissed. The branch of mathematics known as Chaos Theory was developed only when mathematicians were able to see that $1 + 1$ does not always equal 2 in the natural world (see *The Meaning of To Add: The Mathematical Experience*, by Davis and Hersh).

- 6 Students are often surprised to learn that all three answers may be correct, as they tend to live in some sort of Euclidean world. See notes in 'From Other Times and Places'.

- 7 The real issue in this question is one of truth. What kind of truth are we talking about?

Links to Other Areas of TOK

- How does the formation of mathematical knowledge differ from that of scientific knowledge and historical knowledge?
- What role does logic play in the formation of mathematical knowledge?
- How does mathematical proof compare to proofs in other forms of knowledge?
- What is the value of acquiring mathematical knowledge?

From Other Times and Places

Most of the geometry taught in schools is based upon the work Euclid undertook over 2000 years ago. However, in the early nineteenth century brilliant mathematicians altered the work of Euclid and formed geometries that gave rise to mathematical knowledge seemingly contrary to that of Euclid. The two mathematicians who formed these non-Euclidean geometries were Riemann and Lobachevsky. Examples of different conclusions reached by the three geometries include:

	Euclidean	Lobachevskian	Riemannian
Parallel lines...	do not intersect	always intersect	do not exist
The sum of the angles of a triangle are...	equal to 180°	less than 180°	more than 180°

Riemann and Lobachevsky came to these different conclusions by falsifying Euclid's 5th postulate (through any point on a plane there is one and only one line parallel to a given line). When this postulate was replaced with other postulates, the entire system of axioms remained consistent, and eventually gave rise to different conclusions. This example shows that how we describe the world mathematically is not necessarily dictated by nature.

Quotations

Mathematics may be defined as the subject in which we never know what we are talking about, nor whether what we are saying is true.

Bertrand Russell

The most distinct and beautiful statements of any truth must take at last the mathematical form.

Henry David Thoreau

How can it be that mathematics, being after all a product of human thought independent of experience, is so admirably adapted to the objects of reality?

Albert Einstein

References

Davis, PJ & Hersh, R, *The Mathematical Experience*, (1999) Mariner Books, ISBN 0395929687

Eves, HW, *An Introduction to the History of Mathematics*, 6th edition, (1990) College Pub, ISBN 0030295580

Kline, M, *Mathematics in Western Culture*, (1965) Oxford University Press, ISBN 019500714X

Russell, B, *Principia Mathematica*, (1997) Cambridge University Press, ISBN 0521626064

Lesson 13: Numbers and Numerals

Context

Most of us are so familiar with the system of numerals we use that it is hard for us to appreciate certain features of that very system. In order to highlight these features, this lesson asks students to design their own system of numerals. In this way, shortcomings and ambiguities in what they create can demonstrate more clearly the necessary characteristics of an effective system for representation and manipulation of numbers.

As numbers are so fundamental to mathematics, this lesson could serve as an introduction to that area of knowledge in the *Theory of Knowledge* guide.

Aims

- To distinguish between numbers and the symbols which represent them.
- To make evident some of the assumptions embedded in our use of numerals.
- To recreate and highlight some of the great leaps forward in number representation throughout the history of mathematics.

Class Management

Divide the class into small groups. Hand out some paper for rough work. Provide a transparency and markers so that each group can present its scheme to the class.

It is important to allow sufficient time for sharing of students' work across groups since it is here that the lesson's aims can largely be fulfilled. Suggested time allocations are:

- 30 minutes for devising a system
- 30 minutes for presenting the systems to the other groups
- 20 minutes for summing up.

One copy of the following focus activity and discussion questions should be given to each group.

The student handout *Numerical Systems from Different Parts of the World* provided with this lesson plan could serve as a follow-up homework assignment to be discussed in the next session.

Focus Activity

Give the students the following task:

- 1 To invent a series of symbols to represent numbers.

These symbols should not be the same as any numeral system known to them.

The number of different symbols and how they may be combined with one another (if at all) is entirely their choice.

- 2 To explain their numeral system to another group of students.

To show their audience how to represent:

- Three
- Forty-five
- Twenty
- One hundred and seventeen

- 3 Devise a series of problems for other students to solve, using their system of symbols.

Discussion Questions

- What is the advantage of employing place value?
- Why does the number system which we generally use have base 10?
- What is the advantage of having a numeral for zero?
- Is there a difference between zero and nothing?

Teacher Notes

A set of assumptions will probably manifest itself. These assumptions generally involve the following concepts.

- **Place Value:** the meaning of a given symbol changes according to its position in the numeral sequence representing the number.
- **Base 10:** the value of a given symbol increases tenfold for every single shift of position to the left.
- **Zero:** students often omit a symbol for zero in their initial scheme, but invent one when its desirability becomes clear.

Links to Other Areas of TOK

- Can we think of mathematics as a language? Which features of language does it possess? Look closely at the following quotation. Do you agree with it?

Numbers constitute the only universal language.

Nathaniel West

- Many words refer to objects or classes of objects in the world (that is, they have a denotation). What do numerals denote or refer to?
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From Other Times and Places

Homework Assignment

Consider the information supplied on the handout Numeral Systems from Different Parts of the World.

Prepare responses to these questions.

- How many symbols are needed in each system?
- Does the system use a base? If so, what is it?
- Does it employ place value?
- Does it use a zero?
- Where exactly did each of these civilizations exist?
- What do the dates associated with the development of each number system suggest?

Quotations

One, two, buckle my shoe; three, four, knock at the door.

Nursery Rhyme

Philosophy is written in this grand book, the universe, which stands continually open to our gaze. But the book cannot be understood unless one first learns to comprehend the language and read the letters in which it is composed. It is written in the language of mathematics.

Galileo

References

McLeish, J, *Number*, (1991) Flamingo, ISBN 0006544843

Joseph, GG, *The Crest of the Peacock*, (1991) Penguin, ISBN 0140125299

Student Handout

Numeral Systems from Different Parts of the World

Egyptian (c. 3500 B.C.)

	1	10	10^2	10^3	10^4	10^5	10^6	10^7
Symbols:		∩	☉	⌋	☞	☝	☺	☼

Example: $12013 = 3 + 1(10) + 2(10^2) + 1(10^4) =$

Babylonian (c. 2500 B.C.)

Symbols: $1 = \top$ $10 = <$

Examples: $23 =$ $95 = 60(1) + 35:$

$4002 = 60^2(1) + 60(6) + 42:$

Mayan (c. 400 B.C.)

Symbols: For 1-19, DOTS AND LINES COMBINED AS IN EXAMPLES BELOW:--

3	9	18	20
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Example: $\cdot \begin{matrix} \cdot \\ \cdot \\ \cdot \end{matrix} \begin{matrix} ||| \\ ||| \\ ||| \end{matrix} | \text{shell} = (1 \times 7200) + (18 \times 360) + (5 \times 20) + 0 = 13780$

Aztec (c. A.D. 1250)

Symbols:	1	20	400	8000
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Example: $9287 =$

Lesson 15: Myths and Fairy Tales

Context

Many students regard myths and fairy tales as sources of purely fictional entertainment. Yet they have been and still are an important source of knowledge and understanding.

Students should consider the ways in which myths and fairy tales might be understood as part of history, psychology, religion and, of course, the use of myth as a pejorative term to indicate falsehood. What sort of understanding is provided by myths? What truths, if any, do they contain and if they contain truths, how can they be verified? How much of what we think to be knowledge or reasonable belief today might, on closer analysis, turn out to have been myth (in the pejorative sense)?

When we realize and reflect upon the universal importance and presence of myths in human civilization, we can be brought to realize the deep human need for qualitative maps of reality to complement the purely quantitative maps of reality provided by the physical sciences. We might also realize the equally dangerous consequences of neglecting the quantitative maps of reality. Students may be brought to realize that our knowledge and understanding requires a sensitive balance between the powers of imagination and those of reason—that upsetting the balance can lead either on the one hand to impersonal, inhuman forms of understanding and knowledge or, on the other, to the equally oppressive tyranny of fiction and fantasy.

Aims

- To analyse the nature of myths and fairy tales as sources of knowledge and understanding about ourselves and our environment.
- To compare the knowledge and understanding which can be gained from these sources with scientific knowledge and understanding.

Class Management

Teachers need only familiarize themselves with a few myths and fairy tales and bring examples in to their class. If further research is required they could turn to writings by Bruno Bettelheim, Carl Jung and Joseph Campbell.

Focus Activity

Ask the students to collect together as many myths and/or fairy tales as they can and bring them to the next lesson. Try to resist requests for further clarification of the task, because it is to be hoped that there will be a variety of interpretations as to what a myth and what a fairy tale is, which will be reflected when the material is presented. This can form a starting point for a discussion of their nature and epistemological status.

Ensure that you bring your own selection of myths and fairy tales from your own and other cultures. You may wish to bring some writings on myths and fairy tales to stimulate some more discussion.

Discussion Questions

- 1 What is a myth?

You may wish to point out the etymological origin of the English word “myth”, namely from the Greek “mythos” meaning a speech/utterance/word in the sense of a story. This contrasts with “logos”, meaning “word” in the sense of rational discourse, discussion, argument. Myths, in one sense, are concerned with storytelling, giving meaning, purpose, value and direction to our lives (that is, qualitative forms of understanding and knowledge). This contrasts with the sciences, which are not normally concerned with questions of human or divine purpose or value judgement, but are rather seen as providing only quantitative maps of reality. These assumptions can, of course, be challenged.

- 2 Can myths provide a way of understanding (ourselves and our world) that is complementary to that provided by logic, science, social science and religion (with which myths are so intimately connected)?

Myths are often concerned with explaining the origins of features of our landscape. The explanation might give an account of how, for example, a mountain, rock or river acquired the features it now possesses. Or myths might relate to features of animals, such as the claws of a lion, the stripes of a tiger, or the spots of a leopard. Or they might relate to human characteristics—such as the origin of a race, nation or tribe. Or they might relate to metaphysical and ontological concerns such as why humans are so powerful and destructive. What explains the origin of our propensity for good and evil? What is the origin of moral principles? Why is there suffering? Why is happiness so fleeting?

Myths and fairy tales have provided answers which are characteristically anthropomorphic. They provide answers that are stories. Can they be regarded as true or valid in any sense, now that the sciences (both physical and social) have come to dominate all our accepted means of understanding and explaining?

- 3 To what degree is it possible and desirable to arrive at explanations and knowledge of our world that are free of all human value judgements and perspectives? Can science ever be value-free and totally objective?
- 4 What are the comparative roles of reason and imagination in science and in myths and fairy tales?

Links to Other Areas of TOK

Myths and fairy tales can be linked to many elements of TOK. Do myths, for example, contain their own logic? How can we define a mythological use of language; and how are mythological and religious forms of language related?

Myths and fairy tales provide potential sources of understanding and knowledge of our environment which may or may not be compatible with those provided by the sciences. The same could be said of our understanding of ourselves.

In some human sciences, such as psychology, myths and fairy tales have assumed great importance: for example, in Freudian and Jungian psychoanalysis as the archetypes of the unconscious. In the study of history, myths and mythological language play a major role.

From Other Times and Places

Modern Myths: what myths (in the sense of stories that are assumed to be true, but have little or no evidence or reasonable justification to support them) are there today in society? Possible examples may include the popularity of the supernatural, phenomena such as fortune telling and psychic powers, also the fascination with UFOs and crop circles, and modern mythologies such as the Star Wars trilogy and Star Trek in many Western countries. This fascination could be related to a human reaction against the cold, impersonal, rational picture of reality presented by the physical sciences, with UFOs replacing visitations by gods to compensate for our loneliness in a meaningless universe devoid of purpose.

Another example of modern mythology might be the rise in popularity of New Age religions and the revival of talk of Mother Earth (a delicate, creative, female life force) in response to environmental concerns and the destructive effects of understanding the earth in purely mechanical, materialistic, scientific terms. Again, this concerns the difference between qualitative and quantitative forms of knowledge and understanding.

There are many possibilities for classroom activities, from discussions to debates to dramatic representations of myths. Could one say that myth and the arts are closely intertwined, where one is re-enacting a story or a drama, weaving together meaning and purpose, in contrast to science, which appears unable to articulate understanding into drama and appears unable to give direction and purpose to human knowledge?

Quotation

Fairy tales or fairy land is nothing but the sunny country of common sense . . . the world is a wild, startling and delightful place which could have been otherwise . . . fairy tales provide a certain way of looking at life: certain things are necessary (in the sense that it cannot be imagined otherwise) in nature. There is no necessary law saying that eggs must turn into birds or that fruit falls in Autumn. The explanation of such events is magic, just like the answer to the question why do mice turn into horses in Cinderella.

... Nature is best explained by fairy book terms: 'charm', 'spell', 'enchantment' (rather than 'laws', 'necessity', 'tendency' et cetera), for they express the arbitrariness of the facts of nature and their mystery. A tree grows fruit because it is a magic tree; water runs downhill because it is bewitched, et cetera.

... This elementary wonder, however, is not mere fancy derived from the fairy tales; on the contrary, all the fire of the fairy tales is derived from this . . . This is proved by the fact that when we are very young children we do not need fairy tales. Mere life is interesting enough.

... Nursery tales only echo an almost pre-natal leap of interest and amazement. These tales say that apples were golden only to refresh the forgotten moment when we found that they were green. They make rivers run with wine only to make us remember, for one wild moment, that they run with water.'

Orthodoxy, GK Chesterton

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Lesson 18: Scientific Claims: an African Perspective

Context

Certain knowledge claims are reliably supported by scientific activity. On the other hand, certain traditional beliefs are justified in a less rigorous manner, although there are similarities in the ways in which each claim might have come into existence: repeated observation, generalization, inspired ideas, or prediction and explanation.

Given these similarities between the origin of scientific claims and these other traditional beliefs, how do we know what counts as science?

- By the subject matter?
- By the nature of the explanation? By the theory or law involved?
- By the proofs?
- Or just by belief?

Aim

- To investigate what constitutes a scientific knowledge claim and whether such claims can be differentiated from other sorts of claims.

Class Management

The activity could be completed in about one and a half hours.

This activity lends itself well to work in small groups. It might be advisable to mix the membership of each group so as to spread the science-inclined students and any particular national or cultural groups. On the other hand, concentrating such differences in particular groups may enrich a subsequent discussion between groups.

Encourage students beforehand to bring examples of taboos or superstitions to the class.

Focus Activity

Which of the following can be regarded as scientific claims?

- 1 During the first seven days after birth, it is dangerous to expose a child to the outdoors or to strangers.
 - 2 When a man and a woman both have sickle-cell anaemia, it is dangerous for them to have children.
 - 3 Singing while bathing is dangerous.
 - 4 Bringing bundles of firewood from the farm into the village is dangerous.
 - 5 Smoking cigarettes is dangerous.
-

- 6 Cutting a tree in the forest without performing certain rites is dangerous.
- 7 Fishing on Tuesdays is dangerous.
- 8 A live, non-insulated electric wire is dangerous to touch.
- 9 Pounding fufu after dark is dangerous.
- 10 Driving after drinking alcohol is dangerous.

Teacher Notes

- 1 In Ghana, infants are not displayed to the public or indeed officially named until (traditionally) eight days after birth. This takes place at an outdoor ceremony. Various explanations are concerned with high infant mortality rates in the past, or with the infant's susceptibility to infection. Thus there may be a social or a biological basis, or both, or something else—symbolic?
- 2 Sickle-cell anaemia is a genetically transmitted blood disorder particularly prevalent in sub-Saharan Africa. When two carriers (that is, having sickle-cell anaemia), each possessing only one copy of the faulty gene (and thus not seriously affected) have children, the chances of any one child having full sickle cell anaemia is 25%. The carrier condition confers extra resistance to malaria, and this is the reason for the high incidence of the gene in this part of the world.
- 3 This is an old Akan taboo from Ghana, possibly related to the toxicity of the soap used in the past.
- 4 Tied bundles of firewood could conceal weapons, or could provide a route for snakes to enter the village undetected.
- 5 No note required.
- 6 There may possibly be some connection with the conservation of forests, especially given the importance of a stock of plant species for herbal medicinal purposes.
- 7 The Ga of southern Ghana do not fish on Tuesdays—origins in conservation or social cohesion . . .?
- 8 As 5.
- 9 Fufu is a Ghanaian food preparation consisting of ground cassava, yam, cocoyam or plantain which is pounded into a starchy paste, shaped into gelatinous balls and served with a spicy soup containing fish or meat. Pounding after dark would require artificial lighting which might attract insects into the mixture. Alternatively, a lack of light would prevent the people involved from seeing what was happening to the dough. Also, pounding fufu is a noisy activity...
- 10 As 5 and 8.

Discussion Questions

- Consider each of the claims given. Suggest how each of them could have come into existence. In each case, what sorts of thinking processes and types of reasoning might have been involved? Observation, generalization, application of generalizations, inspiration...
- Compare your answers for the different claims. Are there aspects of the thinking processes involved which are common to most or all of them? If so, what are they?
- Is it possible to construct very different, but equally believable, routes by which these claims could come into existence? Compare different claims here. What problems are there in suggesting their possible origins?

- Which of the claims do you regard as being scientific? Justify your answers. Do you have a single criterion for distinguishing the scientific from the non-scientific? Or is it necessary to use several criteria? Has the distinction more to do with method or content or result, or something else?
- If a claim works in everyday life, is there any need for further explanation? Does it matter what kind of explanation is provided?
- To what extent is each of us as an individual justified in believing each of these claims?
- Why do non-scientific beliefs persist in groups of people familiar with scientific explanation?
- Explanations for taboos are often given in supernatural terms. Is it possible to reconcile natural and supernatural explanations?
- If science and taboos are both about laws, then how, if at all, do these types of laws differ?
- Is this attempt to rationalize beliefs always justified? Are there beliefs which arose in quite non-rational ways? If so, how?

Links to Other Areas of TOK

- Does knowledge always require that good reasons be provided?
- In what way, if any, might the phrase “good reasons” vary across cultures?
- What is meant by the scientific method? How is this method traditionally described in science textbooks? Is this depiction an accurate model of scientific activity or could it be a distortion?
- How does the social context affect the questions and results of the scientific enterprise?
- What is the demarcation between scientific and pseudo-scientific knowledge claims?
- In the context of attempting to explain and predict human behaviour, what sort of approach would be most effective? A scientific approach? An approach based on cultural beliefs?
- To what extent is it necessary that a person’s beliefs are consistent?

From Other Times and Places

- List some superstitions or other beliefs from your own background. What sort of claims are these? How do they compare with the examples here?
- Traditional beliefs are sometimes criticized on the basis that they do not explain things. Consider Newton’s Law of Universal Gravitation. What is and what is not explained here? Is there a difference between science and medicine in terms of the explanations they aim at or provide?

Quotations

Science is facts; just as houses are made of stones, so is science made of facts; but a pile of stones is not a house and a collection of facts is not necessarily science.

Henri Poincaré

Science is nothing but trained and organized common sense.

TH Huxley

Lesson 20: Webs of Explanation

Context

Explanations in various disciplines often seem to rely on what is known from other disciplines. This lesson investigates how different subjects are related in terms of such explanations. In this way, the extent to which knowledge can be regarded as a continuum can be discussed. The lesson is best used after the mid-point of the course.

Aim

- To investigate the relationships between different forms of knowledge by focusing on explanations.

Class Management

Hand out copies of the statements sheet (in the focus activity) to the entire class. Ask the students to classify the statements according to the two questions at the foot of the sheet.

Focus Activity

Student Handout

Statements

- 1 Organic remains turn into oil because high pressure and heat prevent organisms from utilizing these remains.
- 2 The behaviour of subatomic particles can be described by mathematical functions.
- 3 Human qualities such as aggression and charisma are the result of the way that the human brain works.
- 4 Ions behave as they do largely because of an imbalance of protons and electrons (that is, they are charged particles).
- 5 Country X invaded country Y because X's leader is aggressive and charismatic.
- 6 There are oil deposits under country Y because abundant plant and animal remains in that area were crushed under pressure at high temperatures for millions of years.
- 7 Country X invaded country Y because country Y has large reserves of oil.
- 8 The brain works largely because of the movements of sodium and potassium ions through brain cell membranes.

Question A To what extent does each of these statements belong in a particular subject discipline?

Question B How can these statements be ordered in a sensible sequence?

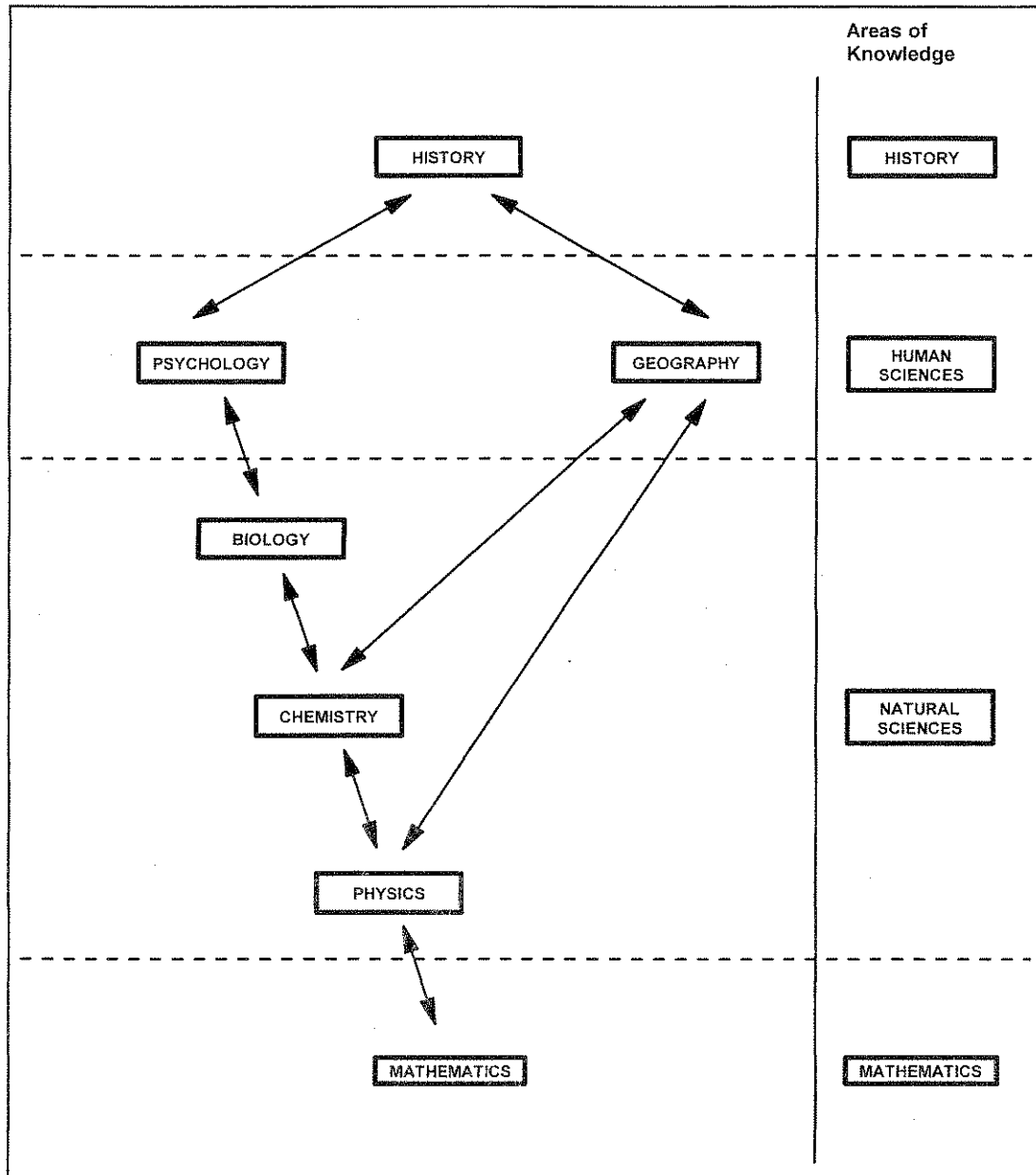
Discussion Questions

- Are the boundaries of disciplines fixed or changeable? Could we create a different set of disciplines which would partition knowledge in a different way?
- Do you think the traditional boundaries between disciplines are 'natural'? Are they helpful to us?
- Are there disciplines which rely largely on explanations from another discipline?
- To what extent is it possible to seal off a discipline from other disciplines?
- Is it possible to string together a number of statements so that one statement can be explained by another statement far removed from it?
- Is everything ultimately explicable in terms of subatomic particles? If not, why not? If so, what would this mean?
- Is there a distinct border between the human sciences and the natural sciences? Or is there simply a continuum?
- Is it possible to produce an ordered hierarchy of disciplines? If so, on what basis?

Teacher Notes

One diagram often constructed by students is illustrated below. Clearly, this is not the only option. The main three issues highlighted by this scheme are:

- 1 alternative frameworks of explanation for history
- 2 a reductive sequence for the natural sciences which may or may not include psychology
- 3 the relationship of mathematics to the other subject disciplines.



Links to Other Areas of TOK

- In what way, if any, should the methods of the natural sciences be exemplars for the social sciences?
- Can human knowledge be confined to what the natural sciences discover? What other important enquiries are not covered by the natural sciences?
- Are causes and reasons both required for full historical understanding?
- Why is mathematics so important to the physical sciences?

From Other Times and Places

It is instructive to examine the ways in which disciplines have been partitioned in the past, for example, 'natural history' and 'natural philosophy'. Why are these categories no longer favoured?

The English use of the word 'science' is quite different from that in Germanic and Scandinavian languages, for example, where its meaning is more inclusive.

In modern times, a number of new interdisciplinary subjects have gained prominence, such as biochemistry, geophysics, art history and economic history. Why?

Quotations

God may have separated the heavens from the earth. He did not separate Astronomy from Marine Biology.

Jonathan Levy

The historian makes a distinction between what may be called the outside and the inside of an event... When a scientist says "Why did that piece of litmus paper turn pink?" he means "on what kinds of occasions do pieces of litmus paper turn pink?" (... the outside of the event). When a historian asks "Why did Brutus stab Caesar?" he means "What did Brutus think which made him decide to stab Caesar?" (... the inside of an event).

RB Collingwood

The human brain craves understanding. It cannot understand without simplifying; that is, without reducing things to a common element. However, all simplifications are arbitrary and lead us to drift insensibly away from reality.

Lecomte du Nouy

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Lesson 21: Atmospheric and Group Pressure

Context

This lesson is most useful as a link between the natural and the social sciences.

In an experiment, a scientist deliberately manipulates one factor to see the effect on another factor. This enables the scientist to draw conclusions about causal relationships. Because experiments are often seen as the ideal scientific method, they are used in human sciences as well as in the natural sciences. One alternative to experiments are naturalistic observational studies, but the results of such studies can only confirm a correlation between two or more factors.

A common-sense understanding of human nature says that humans differ from objects because they have a mind and free will. This means that human sciences such as psychology must use methods different from those used in natural sciences. Not all psychologists agree with this. Many have the opinion that the methods that have proven so successful in such sciences as physics ought also to be used in psychological research.

Aims

- To investigate similarities and differences between experiments in physics and psychology.
- To compare and contrast knowledge claims made in natural science and human science.

Class Management

- Allow 40–60 minutes for this lesson.
 - Divide the students into groups of four or five.
 - Each student should be given copies of the two experiments and the discussion questions.
 - Allow 20–30 minutes for students to read the experiments and to discuss the questions before reporting back.
 - The remaining time is spent in whole-class discussion, which may continue next time the class meets.
-

Focus Activity

Student Handout

Two different experiments are described in your handout.

- Read the information regarding each experiment.
- Prepare to discuss the questions provided at the end of your handout.
- Select a group leader to report to the rest of the class.

A Physical Experiment

Background

Even in Ancient Greece it was known that it is impossible to pump up water from a well deeper than approximately 10 metres. In the sixteenth century Galileo considered the problem, but he could not explain why. His student Torricelli, the inventor of the mercury barometer, developed the theory of atmospheric pressure to explain the phenomenon. In the seventeenth century, this theory was supported by an experiment carried out by Pascal.

Pascal's Experiment

Pascal used a bowl, a tube closed at one end, and some mercury, as shown in Figure 1. He filled the tube with mercury and turned the tube upside down in a bowl also containing mercury. The mercury in the tube did not sink to the same level as the mercury in the bowl. The level in the tube was approximately 760mm higher than the level in the bowl. He then carried the apparatus up a mountain. At the summit he found that the level of mercury in the tube was now lower than before. Pascal concluded that his finding gave evidence of the existence of atmospheric pressure. The pressure from the atmosphere on the surface of the mercury in the bowl was equal to the pressure from the mercury in the tube.

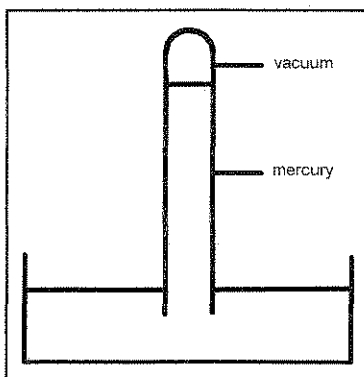


Figure 1

A Psychological Experiment

Background

Conformity refers to behaviours or attitudes that occur as a result of real or imagined group pressure. When people conform to unspoken rules, they tend to believe that they are doing so out of their free will. A number of social psychologists have researched different aspects of this phenomenon over the years, especially after the second world war and the Vietnam war.

Asch's Experiment

Asch, a North American social psychologist, designed and carried out his famous experiment in the early 1950s. In his experiment he used 10 pairs of cards, similar to the ones in Figure 2. On one card in each pair there was a line of standard length. On the other card there were three lines of different lengths, one of equal length to the standard line.

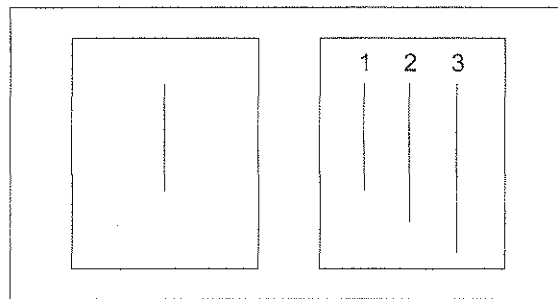


Figure 2

He also used groups of seven students as the subjects of his experiment. Some subjects were asked which line was equal to the standard line. Unknown to one group member, the other members of each group were “opponents”, instructed by the experimenter to give wrong answers on certain critical trials. Approximately 25% of the subjects never conformed, 33% conformed to the group’s incorrect decision more than half the time, and 5% conformed all the time. When subjects were asked the same question in the absence of the group, their answer was correct in more than 99% of all cases.

Later on, Asch carried out variations of his experiment and found that:

- the number of opponents had an effect (see Figure 3)
- if a dissenter was present, the conformity rate decreased even if the dissenter did not agree with the subject’s view.

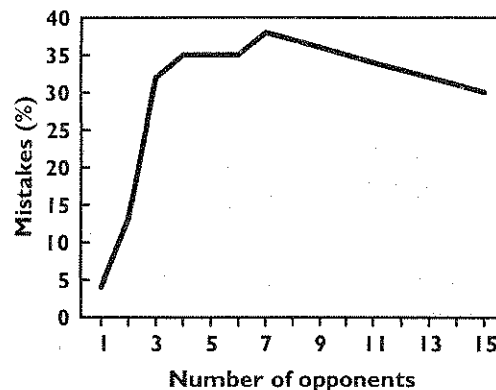


Figure 3

Discussion Questions

- What are the essential similarities and differences between the two experiments?
- The concept of “pressure” is used in both contexts. Is it used in the same way? Justify your answer. Find other concepts that are also used in both the human and the natural sciences.
- Compare the use of experiments in different human and natural sciences. Is there any science that does not use experiments? Are experiments used in mathematics?
- The physical experiment using mercury was carried out in Italy. The psychological experiment involving students was carried out in the USA. Are these results relevant to other places, other countries, other fluids or other humans? Justify your answer.
- Humans are assumed to act out of free will. Is this assumption contradicted by the results of the conformity experiment?
- Sometimes psychologists are criticized for causing harm to subjects in experiments. Are moral values relevant to Asch’s experiment? Justify your answer. Are moral values relevant to Pascal’s experiment? Can harm done to experimental subjects ever be justified?
- In medicine and psychology animals are used as models for humans. Are they a relevant model? From a moral point of view, is it acceptable to use animals?
- Compare ethical codes for experimenters in different sciences.
- Propose ethical codes for experimenters in different sciences.

Links to Other Areas of TOK

A clear comparison between the natural and human sciences is offered in this lesson. The students may be asked to suggest examples of similarities and differences between the methods of the natural sciences and those of the human sciences.

From Other Times and Places

In Ancient Greece the experiment was **not** considered the ideal scientific method. This was mainly due to the fact that nature was seen as an ideal, to be admired, not to be tampered with and manipulated. To classify phenomena and to speculate about the purposes and aims of natural phenomena was more acceptable in the philosophy of nature, the predecessor of modern science. Aristotle, for instance, distinguished between natural and unnatural motions. A stone falling downwards to the ground and the flames rising towards the sky were seen as natural motions, while lifting a stone was considered unnatural and something to be avoided.

In medieval times, research mainly consisted of finding out what religious and ancient authors had to say about nature, rather than questioning their ideas and testing for fallibility.

During the European Renaissance the experiment became the established way to research nature. One of the most widely known experiments, according to contemporary accounts, was when Galileo tested Aristotle’s theory that the speed of a falling object is determined by the weight of the object. Galileo tested the theory when he simultaneously let two lead balls of different weight fall from the tower of Pisa. The theory was refuted since the balls hit the ground simultaneously.

Some religious groups do not allow the advances made possible by scientific experiment, such as modern medicine, in daily life. They look to other sources of control and comfort. Why might this be so?

Lesson 22: A Cultural “Rorschach Test”

Context

Hermann Rorschach (1884–1922) was a Swiss psychiatrist who devised a personality test involving the presentation to a subject of a standard set of ink blots. The subject is then invited to say, on the basis of the immediate image stimulated, what the ink blots suggest or resemble.

In this TOK activity students are asked to register the very first image that comes to their mind, when given a certain **label** for a category of people. What attributes of age, gender, sexual orientation, race, economic status, culture, and other characteristics do students attribute to people labelled media tycoon, homeless, fraudster, and so on? In this manner, students are encouraged to examine the nature of their stereotypes and prejudices.

Aim

- To examine some hidden assumptions in our use of language and the relationship of these assumptions with the social power structure.
- To examine how hidden assumptions affect our construction of knowledge and our beliefs about ourselves and the world.

Class Management

This lesson can be completed in 45 minutes. However, the discussion can become so rich that you might want to spend more time on it.

Twelve categories, each containing five labels, are provided in the *Focus Activity* section. A possible title, such as “The Powerful” or “The Powerless”, is provided to describe each category.

To maximize classroom efficiency prepare cards for the labels in advance. On the **back** of each card write the label (for example, media tycoon, homeless person, fraudster), and on the **front** of each card write Category 1 A, Category 2 A, Category 3 A, and so on. Allowing for the five labels in each of the twelve categories, you will need 60 cards.

Divide the class into three, four or five groups, each ideally containing at least three students. Group 1 should be allocated the A labels; group 2 the B labels, and so on. The cards should be laid front upwards, so the students cannot see the label, only the category.

Focus Activity

Distribute the labels.

During the activity one group should not know the label another group is working on.

Students in each group should each read a label, and respond to it in 30 seconds by noting down the first mental image that comes to mind of a person in that category. The students might either draw a quick sketch or write a brief description of the person. Let each student begin work as soon as the card is read. These written or drawn descriptions are intended to serve only as reminders to the students of what their immediate image was.

When the groups have worked with at least eight cards each, begin compiling results.

Compilation

For the first category students responded to (category A), ask them to raise their hands and vote on how they portrayed their labels regarding:

- Age—Old? Middle-aged? Young?
- Gender—Male? Female?
- Sexual orientation—Heterosexual? Homosexual? Bisexual?
- Race—Use names appropriate to your locality.
- Economic status—Rich? Well off? Solvent? Poor? Destitute?
- Physical attractiveness—Use the adjectives your students suggest.

For each portrayal, note down the choices that received the most votes, so that a stereotype for the category is compiled (for example, category A = old, male, heterosexual, white, rich, tall and dignified). If the vote is almost tied, include both adjectives (old, male or female . . .). If there is very little agreement, do **not** include that characteristic in the description of the stereotype.

After the stereotype for the first category is compiled, deal with all the labels to which the students responded, and ask them to think of a title that describes all of them. Their titles may or may not agree with the ones included in categories 1–12. Write down the titles chosen to describe the categories. Proceed in this fashion with all the categories and labels covered, so that you have a list that might look like this:

The Powerful: old, male, heterosexual, white, rich

The Criminal: young or middle-aged, male, heterosexual, white, poor

Nurse: adult, female, heterosexual, Afro-American, solvent.

At this point, students should be aware of their personal stereotypes, as well as of the stereotypes of the larger group (which, depending on the class composition, may or may not reflect the cultural stereotypes of the society they live in). They should also be aware that people attribute different connotations to the same word. When a list like the one above is compiled, class discussion can begin.

Categories and Labels

	Category 1: The Powerful
A	Media tycoon
B	CEO of a large corporation
C	Person who owns a bank
D	Head of state (president, queen)
E	Religious leader

	Category 2: The Powerless
A	Homeless person
B	Beggar
C	Slave
D	Welfare recipient
E	HIV-positive person

	Category 3: The Criminal
A	Fraudster
B	Mugger/robber
C	Serial killer
D	Drug addict
E	Car thief

	Category 4: The Accomplished
A	Nobel Prize winner
B	Professional athlete
C	Rock star
D	Professor Emeritus
E	Symphony orchestra conductor

	Category 5: The Low-Status
A	Garbage collector
B	Janitor
C	Farmhand
D	Street sweeper
E	Security guard

	Category 6: Women
A	Hairdresser
B	Teacher
C	Secretary/receptionist
D	Executive secretary
E	Cook

	Category 7: Men
A	Chef
B	Hairstylist
C	Educator
D	Administrative assistant
E	Office manager

	Category 8: The Professional
A	University professor
B	Judge
C	Medical doctor
D	Lawyer/attorney/legal counsellor
E	Dentist

	Category 9: The Respected
A	Astronaut
B	Writer
C	Explorer
D	Artist
E	Scientist

	Category 10: Generation X
A	Student
B	Internet web surfer
C	Math whiz
D	Olympic contestant
E	Rock concert-goer

	Category 11: Agents of change
A	Leader
B	Innovator
C	Inventor
D	Revolutionary
E	Expert

	Category 12: The Human
A	Consumer
B	Primary caregiver/nurturer
C	Retired person
D	Voter
E	Shopper

Discussion Questions

How are social stereotypes learned? (Induction? Abstraction? Classification?)

Does the name used for a category influence the stereotype? Must a different name be used in order to transcend the stereotype? With languages that use gendered nouns and adjectives, how difficult is this to do? What is politically correct language?

To what extent are we limited by stereotypes in our beliefs about what we can do in the world?

To what degree are our language and knowledge influenced by the dominant social group?

Links to Other Areas of TOK

Specific Links

The process of stereotyping can be related to induction and deduction.

The idea of normal as a numerical majority (as opposed to normal as defined by the group in power) can be related to the bell curve and to statistics, extensively used in the human and natural sciences. Interesting connections exist between the bell curve and psychology (What is mental illness? What is aberrant sexual behaviour? What should a normal 3-year-old be able to do?) and to medical diagnosis (limitations of medical practice: What happens when a person's symptoms are atypical?).

General Links

The idea of power within a society can be connected to all areas of the TOK course.

From Other Times and Places

Did the same patterns of relationships between language, power and knowledge exist in the past? Do they now exist in other places? (When is it still relevant to say female voters?) If a different group were in power, what effects on knowledge and society might follow?

Quotation

When we attend a conference on African-American Mothers and Daughters, we understand that the subject matter is partial and particular. There is no pretence of putting forth truths for all womankind. The very presence of the prefix or marker African-American acknowledges the existence of others whose experience may be different but no less central... We should have called our first conference, "White, Middle-Class, Heterosexual Women in Context."

HG Lerner

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Lesson 24: The Art Critic

Context

This lesson can be used as a general introduction to the arts. No prior knowledge is needed.

Aims

- To investigate the criteria on which we judge a work of art.
- To consider the extent to which such criteria might be common to us all.
- To investigate the influence of gender and culture on our judgments.

Class Management

A large room is needed to provide students with the space to work on their own creations. The activity works best with 25 to 30 students. The lesson requires considerable preparation. The following items will be required by each student.

At the start of the lesson:

- a glue stick
- a piece of white A3 thin card or paper
- 12 coloured shapes of different sizes, such as equilateral, isosceles and irregular triangles; rectangles; squares; and circles. The shapes should be of different sizes but about 5–10cm across. Each student should receive an **identical** set of shapes.

Midway through the lesson:

- a pencil
- a small piece of paper.

In addition, the teacher will require a thick marker pen, and an OHP, with a transparency and markers. It is useful to prepare an outline grid on the transparency in advance.

Student	1st	2nd	3rd
1			
2			
3			

The number of rows in the grid should correspond with the number of students.

Focus Activity

Without introduction, each member of the class is given a glue stick, the paper/card and the shapes and asked to spend 10–15 minutes making a picture or design pleasing to themselves. Have everyone put their names on the reverse side of their work. Then collect the results and give a short break for the students to leave the classroom.

While the class is out of the room, number each work of art sequentially, then lay out the work as in an exhibition.

Call in the class, giving each student a pencil and a small piece of paper as they enter the room. Then explain that everyone is required to be an art critic. Each student is to spend 5–10 minutes looking at the works of art before deciding which is best, next best and third best. Once this is completed, the students record the numbers on the piece of paper and hand it in to the teacher.

As the selections are handed in, the grid is completed so that the number of students voting for each piece can be totalled. Once this has been done, discussion can begin.

Discussion Questions

Discussion is guided by the outcome of the selection. However, overwhelmingly, past experience indicates that the selection will not be random. Instead there will be clear favourites—a significant majority will vote for the same three or four works of art. If this has occurred, discussion could begin as soon as the most popular works of art have been identified and displayed separately.

Begin by asking each person who voted for the most popular work of art to give their reasons. It will be useful to have someone appointed to note down the essential points as they are made. Are there common reasons? If so, what are they? Issues often raised include:

- realistic representation, as distinct from abstraction
- content (possible emotions or ideas conveyed)
- choice of colour
- use of space, including issues such as symmetry and pattern
- possible differences in preferences between male and female
- possible differences in preferences between students taking visual arts and those who are not.

Turn now to students who did not vote for the most popular work of art. Ask each of them to give their reasons. Do any common themes emerge?

If this is used as an introduction to the section on the arts, it is not necessary to try to close the lesson by making a set of neat conclusions. It is enough to raise questions of content, form and bases for judgment.

Links to Other Areas of TOK

- Are any of the criteria for judgment reported here relevant to other areas of knowledge? For example, on the basis of what criteria do we judge a mathematical proof? How do we decide between rival scientific theories?
- To what extent can we use logical reasoning to justify our choices in this activity? To what extent are other ways of knowing, such as perception and emotion, relevant here?

From Other Times and Places

- Does our cultural background determine, or to any extent affect, our valuation of a piece of art? What effect does our social status have?
- To what extent do you consider that we are competent to judge works of art from other cultures with which we are not familiar? Does it matter if we see things in these works of art that are different to those the artist intended?
- Are we competent to judge works of art from the distant past? Is there any evidence to suggest that, at different times in the past, different valuations would have been made?

Quotations

I've measured it from side to side;
It's two feet long and three feet wide.

Anon

How do you like what you have? This is a question that anybody can ask anybody. Ask it.

Gertrude Stein*

References

The introductory chapter to Kenneth Clarke's *Civilisation* (London, 1971: BBC Books) provides some stimulating ideas about aesthetic judgments in general.

Minimal Art: A Critical Anthology, ed. Battcock, G (1995) University of California Press, ISBN 0520201477

*No reference available.

Lesson 28: Third World Blues

Context

This lesson is meant for a class that has already explored the problems of knowledge that arise when we are confronted with moral as well as political judgment.

The lesson is designed to highlight the logical difference or other relationship between “facts” and “values”. It presents a concrete example to help explore a fundamental philosophical question: can you derive an “ought” from an “is”? In other words, is it possible to gain knowledge about what we ought to do from knowledge about what is the case?

Aims

- To identify elements of political decision making.
- To examine the relationship between moral judgments and political judgments.
- To identify the problems of knowledge that arise when we are making a political judgment.
- To differentiate between “facts” and “values”.

Class Management

The lesson requires 40–60 minutes for a class of 12 to 20 students. In small groups, students should spend 20 minutes studying the situation and then develop an argument that responds to the question. The rest of the lesson will be devoted to open discussion.

Focus Activity

Consider the following moral principles.

- There is something about human beings of incomparable moral significance, such that all human beings merit equality of treatment, no matter how unequal in talents, achievements or social status.
- Everyone deserves respect.
- Everyone’s happiness or suffering is of moral importance.

Now examine the following political situation.

The Country

Nowanda is a small country with many economic problems. The poor represent 44% of the population; the unemployment rate is around 30%; corruption is widespread in the government; the country is in debt. A large overseas creditor demands a change in Nowanda’s internal policies in order to meet their debt.

Fact

A study by scientists has shown that the poor are less well-endowed intellectually than others.

The New Policy

The overseas creditor wants the government to remove the poor from the country's schools because science has shown that the poor benefit little from their education. As a result, the cost of education will decrease, Nowanda's economic position will improve, and they will be able to pay off their debt.

Question

If all the citizens of Nowanda believe in the three moral principles stated earlier, and you are a citizen of Nowanda, how would you determine whether the new policy is right or wrong?

Task

In small groups, discuss the situation above. Designate a leader for your group to present an argument in response to the question.

Discussion Questions

- How does our knowledge of the three moral principles correspond with our knowledge of the needs and interests of the people of Nowanda? Is the policy suggested by the overseas creditor logically consistent with the three moral principles?
- Respond to the following statement. "Knowledge of the concrete needs and interests of the people of Nowanda alters our understanding of the three ideal moral principles."
- Is it logically possible to know, with certainty, how to move from facts about Nowanda to what ought to be done about Nowanda?
- The new policy is based mainly on Western scientific evidence, which means that it is in principle falsifiable. In other words, more research could prove it to be false in the future. Should the people of Nowanda accept the findings of Western science? Justify your answer.

Links to Other Areas of TOK

- How do moral principles influence the application of our scientific knowledge?
- How does our scientific knowledge influence our moral outlook?
- Are the meanings of words like "suffering", "happiness", "respect", "morally significant" fixed or changing?

Quotations

Some eyes want spectacles to see things clearly and distinctly: but let not those that use them therefore say nobody can see clearly without them.

John Locke

Locke, J, *An Essay Concerning Human Understanding* (1689; reprinted many times) Book 4, Chapter 17, Section 4*

*Full reference unavailable.

Lesson 30: Let it Fly

Context

This exercise is ideally suited as a culmination of various considerations of knowledge; specifically truth, belief, logic, perception/reality, language, evidence, modelling and mathematics. It is an appropriate way to end a major portion of the TOK course.

Aims

- To reflect on the nature of knowledge as a product of experiment and experience.
- To relate the construction and performance of a model airplane to various subject areas of TOK.
- To develop an argument for why or why not the model actually achieved flight.

Class Management

Divide the class into groups of three. It will require some prior class time for the introduction of the topic and building the plane. The presentation of the project should take about 5–10 minutes for each group.

After the project presentation, 45–50 minutes should be devoted to an open discussion concerning the links to various elements of TOK.

Focus Activity

The task of each group is to construct a model airplane, powered only by one or more balloons. It should be able to run off a suitable ramp, stay airborne for at least 10–30 seconds, and land relatively intact. Any materials may be used but all must be “original” (that is, the wings for the airplane cannot have been wings from any other vehicle). The groups will have one week outside class time to create and test their model.

One week later, begin class with a general discussion of how the models were built and tested. Then move to a setting suitable for testing the planes (eg the school auditorium). Once all groups have had a chance to test-fly their models at least once, discuss how the models performed in the experiment. Follow with a more expanded discussion of how the project relates to a variety of TOK concepts such as knowledge, belief, truth, mathematical knowledge, scientific knowledge, perception and reason, language, evidence and modelling.

Discussion Questions

- How did the plane’s performance differ from your expectation of its performance?
 - Explain how logic played a role in the project. How and where did logic fail? How did your logic become faulty? Was the logic sound, but the conditions faulty?
 - What basic assumptions/beliefs were behind your construction of the plane? How did you test those assumptions?
-

- How did your model change during the construction process? How did your perception of the model change?
- Did you believe that your model would fly? What happened when your belief was either confirmed or disproved?
- How did mathematics and science play a role in the project?
- What forms of knowledge were involved in the completion of this project? How has your knowledge changed or increased as a result?

Links to Other Areas of TOK

- How is language related to the formation of concepts?
- What problems might be encountered in translating words and meaning into action?
- How are inductive and deductive reasoning used in scientific explanations?
- What is fallacious reasoning?
- What methods are there for verifying what is taken to be true?
- Under what conditions do beliefs change?

From Other Times and Places

Teachers may want to explore how early versions of airplanes and attempts at flight were made. Leonardo Da Vinci and the Wright brothers would be appropriate. Some of the epic failures of flight should also be considered. Consideration could be given to whether (or not) attempts at flying were a Western phenomenon. Other philosophies may hold that, given the lack of wings, humans were not meant to fly. The story of Daedalus and Icarus may be of interest here.

Quotations

Science is a human construction. It is what happens when human beings together try to make sense of their experience of nature. Works of science are ways of understanding created human effort which, like works of art, can be interrogated for what they say about ourselves and our development. By finding out about our science we can find out about ourselves.

Joseph Schwartz, *The Creative Moment*

Give me a place to stand and a lever long enough and I will move the earth.

Archimedes, c.220BC, widely quoted

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