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Part One:

The Sources of Knowledge

Problem-Focus: How can we determine which facts are true?

In his book, *Human Knowledge*, Bertrand Russell says, **"What each man knows is, in an important sense, dependent upon his own individual experience: he knows what he has seen and heard, what he has read and what he has been told, and also what, from these data, he has been able to infer"** (pp. xi-xii).

With this statement, Russell has identified the basic sources of our knowledge: *sensory experience* (seen and heard), *knowledge from others* (read and told), *knowledge by implication* (being able to infer), and *knowledge based on memory that enable us to utilize all the rest.*

Because each of these sources of knowledge make a claim to truth, we are led to ask of them: "How do we know for sure that what we claim to be true is, in fact, true?" To put this another way, when asked about the nature of truth, we are being asked: "What do you know?" "When did you experience it?" "How did you experience it?" and "By what criteria did you judge this information as true or false?"

From the period of history we call the "European Enlightnment" — roughly 300 years ago— until today, epistemic issues have been the focus of discussion and debate, especially among those doing research and who are dependent on accurate information. Then, as today, in many circles faith and religious dogma claimed to be the sole arbiters of truth. Thus, when the Church said that the earth is flat, all men were supposed to accept this as true.

On the other hand, science and reason combined to cause a knowledge explosion which ushered in a new age of discovery and an industrial revolution. Gradually, in mathematics and physical matters the intellect replaced faith and dogma as standards of truth and managers of reality.

But for those who desire to think and develop their intellectual resources, the basic questions concerning the nature and scope of human knowledge beckon to be answered. Each new age must come to grips with assessing its own standards of truth by those methods which give their culture power and meaning. Reason and experience have combined with mathematics to give us science and technology. At the beginning of the 20th century, John Dewey organized these knowledge patterns into a method he called "inquiry" and which we call the "scientific method."

Even the problem-solving method of Dewey is today challenged by those who live on the edge of truth; by those involved in new age religions, Satanism, and other closed systems of thinking. This is why the question is asked anew in every generation: "Exactly what is the human mind capable of knowing and how does it know it?" Today, critical thinkers can accept nothing at face-value and must re-evaluate the standards of truth as fresh information and new theories challenge our time-worn assumptions.

Truth-seekers must remain open minded and be willing to reevaluate, reconsider, and change if reason and evidence demand it. For example, a major issue is whether knowledge is limited to physical experience or if belief, intuition, and reason play a part in what we know and understand. When an observation-statement is made such as "The cat on the roof is black," how do others know that you are telling the truth? How do you know for sure that your observation is correct? If the truth of your observation-statement is challenged, how will we be able to separate truth from error?

By this time you are saying that Philosophy, especially epistemology, is confusing; that it doesn't make any sense. We hear this from students and, believe it or not, we also hear it from teachers. Philosophy is confusing because we have not been taught to think. We have become mentally stagment. Our traditions and beliefs have not been re-examined by us; we've not had problems with them, so

Lesson #1

Empirical Knowledge

Concepts:

Empirical, fact

Skills:

Concept formation, solution formulation

Fallacies:

Hasty conclusion, suppressed evidence, appeal to authority

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Objectives:

The student will...

1. Define and give an example of "empirical knowledge;"
2. Identify, clearly state, and formulate a solution to the problem of Ben and John; and
3. Apply knowledge of thinking fallacies used in this lesson.

Procedures:

The teacher will...

1. Review problem focus and introduction to Part One;
2. Share objectives of this lesson with students;
3. Present inquiry lesson to students;
4. Engage students in oral and written activities; and
5. Close lesson with a review of lesson concept.

Questions:

1. What accusation was brought against Ben and John?
2. Were empirical facts used to prove them guilty?
3. What assumptions did Mrs. Miller make?
4. What other evidence could be brought to bear on this case?
5. What fallacies of reason were committed in this lesson?

Inquiry Lesson: Empirical Knowledge

At 9:00 on Monday morning Ben and John were called to the principal's office. There they were joined by Mrs. Miller, their Language Arts teacher, and Mr. Baker, a history teacher in their school. Mrs. Yount, the school principal, asked them to come into the office, to close the door, and to have a seat on the blue sofa next to the window.

Mrs. Miller, apparently angered by the presence of the two boys, began by saying, "Last week, on Friday morning, when I was in the school media center, you two boys entered my room and stole $30 from my desk. I know you did it! We have a witness—Mr. Baker—who saw you, so you might as well tell the truth!"

"Wait just a minute, Mrs. Miller," interjected Mrs. Yount. "Before we start accusing every student who was in your room on Friday, why don't we listen to what Ben and John have to say. Afterall, shouldn't we assume their innocence until they have been proven guilty—you know, until we have sufficient evidence to prove them guilty?"

Lesson #4

Our Knowledge of General Principles

Concepts:

General principles

Skills:

Concept analysis, managing information

Fallacies:

Ad homenin

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Objectives:

The student will...

1. State the characteristics of a general principle and give both an example and nonexample of a general principle.
2. Explain the differences between general principles used in mathematics and those used in science.
3. Apply the thinking fallacy to this lesson.

Procedures:

The teacher will...

1. Review the concepts of knowledge and prediction.
2. Share objectives of this lesson with students.
3. Present inquiry situation to students.
4. Engage students in oral and written activities.
5. Close lesson with a review of the function of general principles.

Questions:

1. What is the position of the strict empiricists?
2. Can a person observe the concept of number?
3. What is a general principle?
4. Can you give an example of a general principle?
5. Do you agree with Jane's definition of "mathematics"?

Inquiry Lesson: Our Knowledge of General Principles

Jane thought to herself:

A book is a book.
A particular thing cannot be in two places at the same time.
A particular object cannot be black all over and white all over at the same time.
A particular object cannot be both a book and not a book.
A person cannot smell a taste and taste a smell.

"Jane, are you asleep or just daydreaming?" asked Dr. Fortner.

"I'm sorry," said Jane. "I was just thinking to myself about what you were saying. The empiricist says that only observable facts can be true. All else is opinion, emotion, or hunch. But if you agree

Profile #4: Sir Isaac Newton

Isaac Newton was born near Grantham, Lincolnshire, England on Christmas Day, 1642 (in the year that Galileo died). His father was a farmer who unfortunately died two months before Isaac was born. His mother remarried and Isaac went to live with his grandmother. After attending local schools, he enrolled in Trinity College, Cambridge in 1661. Isaac was able to study with the brilliant mathematician, Dr. Isaac Barrow at which time he began to exhibit his brilliance in mathematics. He graduated in 1665.

Due to black plague, Isaac stayed home during the fall of 1665, but there he was able to develop the differential calacus and formulate various applications of mathematics which accounted for the law of gravity. He even speculated that what affected an apple on earth might also affect the moon. For example, if the moon was held in orbit around the earth, then perhaps all the planets might be held in orbit around the sun by the same force.

Today we no longer question this idea, but in the 17th century it was new and questionable. Newton continued to work in mathematics, and astronomy. He says in the *Principia* that "all the difficulty of philosophy seems to consist in this—from the phenomena of motions to investigate the forces of nature, and then from these forces to demonstrate the other phenomena."

Newton was not the nice guy you might think. He argued in front of the Royal Society (in England) that he was the originator of mathematical calculas, and not Leibniz. Indeed, he was harsh in his attack on Leibniz. Today we know that both Newton and Leibniz, working independently of each other, invented mathematical calculas. He was a wild character who wrote, not only scientific papers, but papers on the Old Testament and dabbled in alchemy.

Newton was president of the Royal Society from 1703 until 1728. Most interesting was his appointment as Warden of the Mint and later Master of the Mint. This is especially interesting considering his interest in alchemy. He was a politician who also served time in the British Parliament. He was no ordinary man!

Newton's major work was the three volume *The Mathematical Principles of Natural Philosophy* (*Philosophiae Naturalis Principia Mathematica*) which was published in 1687. It is generally referred to as the *Principia* and is a book which has had the world's greatest impact on scientific and philosophic thinking. In it we find Newton's three basic laws of planetary motion. These laws utilized empirical observation, mechanics, and mathematics to explain the workings of the universe. They are:

1. Every body continues in its state of rest or of uniform motion in a straight line unless it is compelled to change that state by forces impressed on it.
2. Change of motion is proportional to and in the direction of the straight line of the motion-force impressed on it.
3. To every action there is always an opposite and equal reaction.

Newton argued that he only was concerned with what he observed and could be treated as facts. He was not interested in establishing supernatural explanations of observed phenomena. This is not the business of science. He explained that a causal argument was of little value unless it could be observed. From his observations he created causal laws, expressed them mathematically and then performed other experiments to confirm his ideas.

Galileo supported Copernicus's theory that the earth moved around the sun and not the other way around. Newton gave us the scientific method and to it the application of mathematical explanation which provided the definition of scientific laws as a basis for extending science beyond what can be observed. It can be said that Newton gave us a method that was the beginning of the modern scientific movement.