Deductive Arguments: A Field Guide by Kathleen Dean Moore, Kendall/Hunt Publishing Co., 1986. 2nd Edition.

Class Exercise 4.1

THE GAME OF ELEUSIS

Learning to Reason Hypothetically

The game of "Eleusis" was first developed in a somewhat different form by Robert Abbott. It is described by Martin Gardner, "Mathematical Games," *Scientific American* (June, 1959), 160. The game requires players to use hypothetical reasoning to uncover a secret rule of play. Scientists and mathematicians are interested in Eleusis because it provides a model of scientific methods.

THE RULES FOR PLAYING "ELEUSIS"

The object of the game is to be the first player who correctly determines the dealer's secret rule. The game uses a standard deck of playing cards. Players are the dealer and three to five other people. Play proceeds as follows:

1. One card is placed face up in the center of the table to start play. The dealer deals out all the remaining cards, face down, to all the players except himself. The dealer gets no cards.
2. The dealer makes up a secret rule that defines the sequence in which the cards can be played. The rule may use suit, face value, color, or a combination of facts about the cards; the rule may not depend on circumstances external to the cards such as the sex of the last player, the time of day, etc.

   Even the simplest rules are difficult to discover, so dealers should make sure their rules are not too complex. If the rule is too complex, the game becomes dull and frustrating. Examples of rules of the appropriate difficulty are "only a red card may be played on an even card" or "only alternating odd- and even-numbered cards may be played."

   The secret rule must be written down on a sheet of paper that is put aside for future confirmation.
3. The first player places a card from her hand, face up, next to the starter card. If the card conforms to the secret rule, the Dealer says "right" and the card remains in the row. If the card violates the rule, the Dealer says "wrong," and the player replaces the card in her hand. ALL THE CORRECT CARDS IN THE ROW SHOULD BE VISIBLE, AND REMAIN IN THE PROPER SEQUENCE.

   The next player, and each player in turn, repeats this procedure.
4. As the row of correct cards lengthens, players try to figure out what the secret rule is. When a player thinks she knows the secret rule, she declares herself an Expert. She no longer plays cards; instead, she calls the plays "right" or "wrong." The dealer says whether the Expert is correct or incorrect.

   If the Expert makes a mistake, she is immediately overthrown, declared a Fake, and thrown out of the game.

   If an Expert makes no mistakes by the time play returns around the circle to her, she reveals the rule she has been using. If she is wrong, she is overthrown and thrown out, and play resumes. If she is right, she is the winner and the game ends.

Eleusis Worksheet

Divide into groups of four to six and play the game once. List the secret rule and the name of the winner of that game:

2. Discuss and answer the following questions about the way you reasoned while playing the first game:
   a. When you were going to play your first card, how did you decide which card to play?

   b. After the game had been played long enough to establish a good line of cards, how did you decide which card to play? (Did you formulate a possible secret rule? If not, what method were you using? If so, what was the basis for your possible secret rule?)

   c. How can you use a card to show that a rule is wrong? Represent your reasoning in a conditional argument. Is the argument valid?

   d. How can you use cards to show that a rule is correct? Represent your reasoning in a conditional argument. Is it valid? If not, what does that tell you about the difficulties of confirming a hypothesis?

   e. Did you have any Fake Experts in your game? What misled the Fake Experts into making a mistake about the secret rule?

f. List some of the secret rules that can explain the following row of cards:

Two of hearts
Three of spades
Four of diamonds
Five of clubs
Six of hearts
Seven of spades

3. **Play the game again.**
List the secret rule and the winner of that game.

4. **Discuss and answer the following questions:**
Your decision-making process can be understood as an instance of hypothetical reasoning.
a. What is the initiating fact?

b. What is the resulting question?

c. What is the hypothesis?

d. What is the prediction?

5. This game is a model for understanding scientific reasoning.
   a. Who does the Dealer represent?

   b. How about the players?

   c. The secret rule?

   d. Playing a card?