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Explanation Games: If He'd Seen the Sawdust...

An explanation game is a game in which participants have to discover an explanation for a scenario or series of events, supplied at the outset by the game leader. Participants ask questions which the leader may answer "yes," "no," or "irrelevant." Participants have, then, to formulate general hypotheses about the form of the hidden explanation and to reject or modify them in response to answers from the leader, until the correct hypothesis is reached. There is no guarantee (far from it!) that the correct hypothesis will be the most reasonable: the correct answer is simply the explanation which the game leader had in mind.

An example of an explanation game begins with the clue: "If he'd seen the sawdust, he wouldn't have died." The answer, it turns out, is as follows: "he" was the shortest man in the world, in the habit of checking this status by measuring himself with a wooden stick of the same length as his height. His rival, the second shortest, had engineered a heart attack by shortening the stick, thus leading the deceased to believe that he had grown, and that his livelihood was in jeopardy. (He makes his living from his lack of height, e.g., in a circus.)

I use these games in teaching philosophical critical thinking at my community college. (The original idea from using them in this context came to me from Dr. Lawrence Resnick at Simon Fraser University.) They are suitable, however, for incorporation into a wide range of disciplines where the attempt is to encourage critical thinking among students. Here I'll try to motivate a belief in their usefulness in teaching both philosophy of science and science subjects in general.

First of all, they constitute active, student-centered, and collaborative learning. Students are actively engaged in thinking in the classroom and must draw on previously-gained knowledge and understanding of the world, working collaboratively, to maximize the efficiency of the solution process. As a result, the games are fun; and the affective responses of curiosity, puzzlement, success, and realization set the tone for other learning activities later in class.

Second, the games promote the development of a number of important reasoning abilities, valuable in academic as well as ordinary life. The kinds of reasoning abilities these games require, and therefore develop, include: memory/recall; precision in choice of expression; attention to consistency and implication; awareness of assumptions behind questions (avoidance of the fallacy of "dubious assumption" or "loaded question"); attention to the generality and specificity of questions with respect to their efficiency in approaching a correct hypothesis; and use of metaquestions (e.g., "Would it help me if I asked...?").

The games can be played with or without instructive comment on questioning strategies; this is very useful once the basic idea has been assimilated by the students. Also valuable is trying to reconstruct the reasoning processes at the end of the game. The assumption, supported by metacognition research, is that self-conscious understanding of the logical processes involved in the games enables students to develop the corresponding reasoning abilities.

Third, the process of the game models the hypothetico-deductive picture of science described by, among others, Karl Popper. At some point in the term I make this explicit, in the hope that familiarity with the games will add to the understanding of scientific method which I wish to convey.

The hypothetico-deductive model of science can be explained through the use of the games by developing the following analogy: in science, hypotheses are tested by developing the logical consequences of one hypothesis which are not also those of another, and finding out by experiment whether these logical consequences are true; if so, the hypothesis receives more support, though there is seldom a final "answer" to this "problem" until one brings in extra-scientific considerations. In the games, players test their hypothetical explanations by thinking of a logical consequence of a hypothesis they have in mind and asking if it's true. The instructor, who plays the role of "Nature," gives more definite answers than she, but the confirmation of a hypothesis is still a gradual process involving the rejection of alternative explanations.

This analogy raises the possibility of modelling scientific reasoning in a parallel sort of game, in which

both scenario and explanation are part of the course content. For example, students could "work out" a theory by designing experiments and asking the instructor what the results would be. Other possible applications might be to standardize analysis of salts (by flame-testing and other reactions), biological classification by anatomical features, and the naming of organic compounds.

In this kind of game, direct attempts to guess the answer would have to be refused, perhaps by distinguishing between "experimental," "hypothetical," and "metahypothetical" questions. Experimental questions ask about the result of a certain experiment, manipulation, or observation. Hypothetical questions are attempts to guess the answer. Metahypothetical questions are about not entirely relevant features of the correct hypothesis (e.g., "Does it begin with the letter A?").

In the initial stages of the game, only experimental questions would be allowed; hypothetical questions would be considered only when a wealth of "experimentation" has already been carried out. Metahypothetical questions might be disallowed entirely, except in one circumstance: If one is impressed by the significance of analogy in scientific discovery, one might accept such metahypothetical questions as, "Is this case similar to the one we had in electricity last week?"

I have not used games of this form myself, since I do not teach in the requisite scientific context, but I have heard of games like this being developed as enhancements of one called Rulemaker. Rulemaker is a mathematical game in which participants try to formulate a rule which explains some sequence of numbers, shapes, playing cards, or whatever. I have not heard of its being employed in the cumulative question-and-answer mode, but I see no reason why it shouldn't.

I have a list of 13 explanation games of the general type which I'd be willing to share with anyone. I would appreciate hearing from anyone using the scientific versions or games like them.

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The International Minute

At Calhoun Community College, we have a list of goals to be accomplished by the year 2000. One of these goals is to include an international element in every course. In response, I implemented an activity called "The International Minute" in my Developmental Reading class. Three international students, one from India and two from Puerto Rico, were to teach my other students about their countries.

I told the three international students that we were delighted to have them in our class, that we would like to learn from them, and that each day I would ask one of them to give us a one-minute lesson on his/her country.

At first the students appeared nervous and came to class with books, pictures, and objects to "show and tell." I had to remind them to teach us just one fact or idea per day and to limit the presentation to one minute. At the beginning I had to help them with their English, get them to write foreign words on the board, or ask them to speak louder. They began by teaching us their names and how to pronounce them. They moved on to locating their countries on the map; telling us the names of the capitals and important leaders; describing holidays, foods, and creatures unique to their countries; and describing beautiful vacation spots we might enjoy visiting. They also explained their educational systems. Toward the end of the quarter they told us what they liked most about the U.S. and what they thought Americans could learn from the people of their country.

The American students enjoyed this activity, asking questions, and commenting frequently. One commented, "If we did this in all of our classes, just think how much we could learn about the rest of the world in just one quarter." This activity also benefited the international students by enabling them to make friends and feel comfortable early on and by giving them practice speaking English in a group situation.

I benefited from the activity, as well. Too often I forget that my students have much to teach me. My rapport with *all* students improved because they saw me as someone who loves to learn.

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