

Book 1: School and University

Teaching Disciplined Hypothesis-Formation

by
Edward G. Rozycki, Ed.D.

A Book of Copy Masters
for Teaching Critical Skills
in Systematic, Empirical
Explanation.

with introductory essays

Teaching Disciplined
Hypothesis-Formation

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Contents:

- To the Instructor: *Teaching Disciplined Hypothesis-Formation*
- Essay: *How to Hypothesize*
(includes definitions and examples)
- Overview of Anecdotes
- Hypothesizing Exercises 1 to 14.

to the Instructor

Teaching Disciplined Hypothesis-Formation

The exercises in this book have been constructed to help develop hypothesizing skills useful in diagnosing situations that arise in educational institutions.

The exercises are preceded by an essay titled, “How to Hypothesize” that explains what goes into scientifically constructing and evaluating hypotheses. This should be given to the students and gone over, if necessary, before the actual hypothesizing training begins.

Each exercise contains two sheets of copy masters: one, for the instructor’s copy; a second, for student copies.

The actual training session is conducted as follows:

- a. The instructor has the students read the **Anecdote** given in the shadowed box. S/he invites the students to formulate hypotheses addressing **item A** in the **Student Directions**. The hypotheses are written in a well-spaced column.
- b. **Item B** in the student directions is addressed. The new hypotheses are added to or substituted for hypotheses already given.
- c. **Item C** in the student directions is addressed. The information is noted in a column to the right of the previously obtained hypotheses
- d. As **item D** in the student directions indicates, the instructor gives an item or items of additional information to the students.
- e. **Item A** is readdressed in light of the additional information, with disconfirmed hypotheses noted and discarded from consideration. The cycle through items B through E continues until all additional information has been provided.
- f. The final hypothesis is tested by addressing the **Additional Student Questions**. Other assumptions or supporting hypotheses needed to bring this part of the exercise to closure should be noted.

No list of answers are given, because no situation is so well determined that a fixed answer need be derived. Very few of the additional questions admit of a specific answer. This indeterminacy mirrors real life. Different answers are admissible so long as reasonable procedures have been used to arrive at them.

It is hoped that the exercises contained herein will provide both substance and discipline to a process that tends all too easily to suffer from lack of both.

How to Hypothesize

Edward G. Rozycki, Ed. D.

(This exposition is not intended to inform theoretically advanced practitioners.)

In the Hypothesizing Exercises to follow we will be dealing with potential *scientific* hypotheses. These are based, ultimately, on evidence rooted in common experience and investigative procedure enjoying rather broad consensus.

A. Let's begin with some special preliminary definitions:

- *fact*: - something which counts as evidence establishing or disconfirming an hypothesis.
- *hypothesis*: - a tentative explanation. The more facts the hypothesis "weaves together," the more it predicts, the more powerful it is.
- *theory*: - a well-established hypothesis. (An imaginative person may easily conceive of conditions which would tend to disconfirm the theory. But until the imagined conditions are established as fact, they do not bear on the theory or on any hypothesis.)

Note 1: In the sciences, a theory is a form of knowledge, unlike in non-scientific discourse which tends to confuse the terms theory and hypothesis and treat *theory* as weaker than *knowledge*. In science, unlike in everyday language, nothing is just "mere theory."

Note 2: Disconfirmable hypotheses achieve the status of theory not so much by being confirmed by fact, as by not being disconfirmed by contrary evidence. That is by withstanding critical experiments. A *critical experiment* is an investigation undertaken to disconfirm a given hypothesis.

B. The nature of hypothesizing has been a item of dispute among scientists and philosophers for a long time. Nonetheless, there are some general "rules of thumb" which are generally agreed to so long as one does apply them uncritically.

The first rule, **Disconfirmability**, is this:

Formulate the hypothesis so that it is disconfirmable.

That is, we must be able to conceive of something that would count as evidence against the hypothesis, whether or not we are in a position at any particular time to undertake an investigation or experiment.

The second rule, **Relative Simplicity**, (also called Ockham's Razor) is this:

The simplest of competing adequate hypotheses is to be preferred.

In the Western scientific tradition, risking oversimplification has proven to be more productive than risking overexplanation. William of Ockham's "Razor" in its original formulation is closer to "Do not multiply entities needlessly."

The third rule, **Groundedness**, is this:

Base your hypothesis on as well-established theory as possible.

In other words, start with what you know and don't get any more speculative than is necessary.

Relations between two hypotheses: (for more advanced students)

1. Two hypotheses are said to be **compatible** if evidence that tends to support one hypothesis does not tend to disconfirm the other.
2. Two hypotheses are said to be **incompatible** if evidence that tends to
 - a. **support** one hypothesis tends to **disconfirm** the other.
 - b. **disconfirm** one hypothesis does **not** tend to **disconfirm** the other.

Examples: Which of the following hypotheses are (most likely) incompatible?

Hypothesis A: Harry is a Supreme Court Justice.

Hypothesis B: Harry is a convicted felon.

Hypothesis C: Harry likes ice cream.

Answer 1) Suppose we see a newspaper listing of the members of the Supreme Court on which we find Harry's name. This evidence supports the conclusion that A and B are incompatible, since felons, we find out from other sources of evidence, are not admitted to the practice of law and Supreme Court justices are (usually) selected from practicing lawyers to be offered to Congress for approval to the position.

(But there is the remote possibility that Harry might have covered up his earlier conviction by changing his name and Social Security number, and then gone into the practice of law.)

Answer 2) A is compatible with C. B, also, is compatible with C. (But there might have been conducted a study that shows that lawyers, once appointed to the Supreme Court, tend to eat much less ice cream, if any, than they did before their appointment.

REMOTE OR MERELY IMAGINED POSSIBILITIES DO NOT DISCONFIRM HYPOTHESES!

Overview of Anecdotes

(Complete anecdotes are found on exercise sheets)

<p>1) It is April 21st when Principal Harold Smith of Stanton JHS worriedly realizes that attendance has dropped off over the last three weeks from a norm of 80% down to 72%. “We have to deal with this,” he announces at the weekly faculty meeting, ...</p>	<p>8) Wilson University President Mila Sharp is away on sabbatical when the worst snowstorm of the decade swoops down on campus at 11 AM. The three vice presidents, equal in rank, are besieged with requests to close the University early and cancel ...</p>
<p>2) Principal Jack Daniels of Frankling HS is concerned with the low standard test scores produced by his students. The school average is 480 out of 800 points. In order to involve the community more in the school, he obtains an \$8000 grant to pay parents ...</p>	<p>9) With Pennsburg State U faced with mounting maintenance costs, newly appointed trustee Roger Williams, a retired manufacturer, calls the Board’s attention to research that shows that in schools whose graduates have the best GRE scores...</p>
<p>3) Titus Glutes, the head of the Wellsboro Chamber of Commerce is reported in a local newspaper to have said of the school superindent, Sara Hamilton, that she “lacks a sense of community”.</p>	<p>10) The Public School Board of Metropolis, from a yearly one billion dollar budget, allots \$20,000 to each of 150 schools as a Principal’s Discretionary Fund. Those funds are audited each year by a duo team of accountants from the prestigious firm ...</p>
<p>4) Superintendent Janice Short at the opening Fall Board meeting of Hawthorne School District declares that the district is “rededicating itself to excellence.”</p>	<p>11) Will Wundt, the forward-looking school superintendent of Yarlborough, has instituted a new program of language instruction in the district, despite resistance from some of the older language teachers. He experimented first ...</p>
<p>5) Only three miles from prestigious Olympus Academy stands T.M. Penury High School. The teachers at Penury tend to fall into two groups: “traditionalists”, who accept no excuses from students for deviation from a strict academic code ...</p>	<p>12) Miss Morelli is dismayed to find out that some of the best students in her German III class, who have had her at least two years, have not signed up for German IV. Instead, they are filling in their rosters with notoriously easy electives....</p>
<p>6) President James Avery at the opening Fall convocation of Hawthorne University, held under the Ancient Beech in the courtyard of ivy-covered Seminary Hall, declares that the University is “rededicating itself to the mission of its founders.”</p>	<p>13) In response to great public concern, the Synecdoche School District in conjunction with Synecdoche State University, launches a coordinated program expanding formerly perfunctory efforts in the areas of sex education and conflict resolution. The SEXCON program,...</p>
<p>7) After several months of escalating gang violence in the neighborhood, the principal of Madison High School has the police conduct a surprise yet thorough search for weapons late in the school day. Those found with weapons -- mostly knives...</p>	<p>14) The STUSORT, a nationally known set of secondary school achievement tests, is updated annually for statistical reasons to remove any items that more than 50% of those tested have gotten correctly. Despite test publisher warnings to the contrary, ...</p>

Hypothesizing Exercise 1

It is April 21st when Principal Harold Smith of Stanton JHS worriedly realizes that attendance has dropped off over the last three weeks from a norm of 80% down to 72%. "We have to deal with this," he announces at the weekly faculty meeting, reminding his staff of School District policy which allots teachers in accordance with a school's previous year's average daily attendance.

Student Directions

Additional Student Questions (to be answered after all information is in.)

- | | |
|---|--|
| A. Formulate several hypotheses as to what Principal Smith is up to. Try to formulate competing hypotheses, if possible. | 1. What does the normal attendance rate indicate? |
| B. Can you combine two or more hypotheses within a more powerful hypothesis? | 2. What dilemmas does Mr. Smith face, both institutionally and personally? |
| C. For each hypothesis determine what information you would need to disconfirm its competitors. | 3. What would you take to be Mr. Smith's primary concern? |
| D. You will be given additional information. Use it to rule out some of the hypothetical alternatives. | 4. What is your estimation of Mr. Smith as a principal? |
| | 5. Can you give a fuller picture of Stanton Junior High School? |

Additional Information (to be supplied by Instructor)

- A. The weather has been beautiful this last month.
- B. School District policy does not permit students to be left back two years in a row.
- C. Most of the chronic absentees were left back the previous year.
- D. Unbeknownst to his staff, Dr. Smith is applying for a position as principal of a large city high school.
- E. There is a large city park nearby.

Student's Sheet

Hypothesizing Exercise 1

It is April 21st when Principal Harold Smith of Stanton JHS worriedly realizes that attendance has dropped off over the last three weeks from a norm of 80% down to 72%. "We have to deal with this," he announces at the weekly faculty meeting, reminding his staff of School District policy which allots teachers in accordance with a school's previous year's average daily attendance.

- A. Formulate several hypotheses as to what Principal Smith is up to. Try to formulate **competing** hypotheses, if possible.
 - B. Can you combine two or more hypotheses within a more powerful hypothesis?
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Additional Questions (to be answered after all information is in)

1. What does the normal attendance rate indicate?
2. What dilemmas does Mr. Smith face, both institutionally and personally?
3. What would you take to be Mr. Smith's primary concern?
4. What is your estimation of Mr. Smith as a principal?
5. Can you give a fuller picture of Stanton Junior High School?

Hypothesizing Exercise 2

Principal Jack Daniels of Frankling HS is concerned with the low standard test scores produced by his students. The school average is 480 out of 800 points. In order to involve the community more in the school, he obtains an \$8000 grant to pay parents to tutor after school. The next round of standardized testing yields a school average of 500. Mr. Daniels calculates that if his next grant is \$32,000, he can get scores up to an impressive 580.

Student Directions

Additional Student Questions (to be answered after all information is in.)

- | | |
|---|--|
| A. Is Mr. Daniels' reasoning sound? What hypothesis does he seem to be working with? What competing hypotheses can you provide? | 1. What kind of hypothesis would make Mr. Daniel's age useful information? |
| B. Can you combine two or more hypotheses within a more powerful hypothesis? | 2. What do you make of the word "officially" in F? |
| C. For each hypothesis determine what information you would need to disconfirm its competitors. | 3. Following Mr. Daniels' logic, what score should result from an additional grant of \$24,000? |
| D. You will be given additional information. Use it to rule out some of the hypothetical alternatives. | 4. What plausible hypothesis can you make about the relationship between tutoring parents and the school status of their children? |
| | 5. What is the highest possible number of students at Frankling High who made 800 on their standardized tests? |

Additional Information(to be supplied by Instructor)

- A. Research indicates that schools with high average standardized test scores have high parent involvement.
- B. Forty tutors are hired for twenty hours each and twenty more parents volunteer their services.
- C. Mr. Daniels is 38 years old and a new principal with 1200 students on roll in his school.
- D. Mrs. Sanders, an excellent algebra tutor whose daughter attends Frankling HS, is hired
- .E. 500 is not significantly different from 480.

Student's Sheet

Hypothesizing Exercise 2

Principal Jack Daniels of Frankling HS is concerned with the low standard test scores produced by his students. The school average is 480 out of 800 points. In order to involve the community more in the school, he obtains an \$8000 grant to pay parents to tutor after school. The next round of standardized testing yields a school average of 500. Mr. Daniels calculates that if his next grant is \$32,000, he can get scores up to an impressive 580.

- A. Is Mr. Daniels' reasoning sound? What hypothesis does he seem to be working with? What competing hypotheses can you provide?
- B. Can you combine two or more hypotheses within a more powerful hypothesis?
- C. For each hypothesis determine what information you would need to disconfirm its competitors.
- D. You will be given additional information. Use it to rule out some of the alternatives.

Additional Questions(to be answered after all information is in)

1. What kind of hypothesis would make Mr. Daniel's age useful information?
2. Following Mr. Daniels' logic, what score should result from an additional \$24,000?
3. What plausible hypothesis can you make about the relationship between tutoring parents and the school status of their children?
4. What is the highest possible number of students at Frankling High who made 800 on their standardized tests?

Hypothesizing Exercise 3

Titus Kluits, the head of the Wellsboro Chamber of Commerce is reported in a local newspaper to have said of the school superintendent, Sara Hamilton, that she “lacks a sense of community”.

Student Directions

- A. Formulate several hypotheses as to why Mr. Kluits made that statement. Be sure to try to formulate **competing** hypotheses, if possible.
- B. Can you combine two or more hypotheses within a more powerful hypothesis?
- C. For each hypothesis determine what information you would need to disconfirm its competitors.
- D. You will be given additional information. Use it to rule out some of the hypothetical alternatives.

Additional Student Questions (to be answered after all information is in.)

1. What do you think the newspaper's editor thinks of the superintendent?
2. What is the dilemma Superintendent Hamilton finds herself in?
3. How large do you estimate Wellsboro to be?
4. Can you give a plausible fuller description of Titus Kluits?
5. How do you suppose the Chamber of Commerce views the School District?

Additional Information (to be supplied by Instructor)

- A. Hamilton awarded a contract for school furniture to Billings, Inc.
- B. Billings, Inc. made a proposal which met School District specifications.
- C. Billings, Inc. was the lowest bidder.
- D. Billings, Inc. is located in Lancaster, PA.
- E. Some Wellsboro CC members sit on the Board of Education.
- F. The Board directed the Superintendent to minimize expenditures.

Student's Sheet

Hypothesizing Exercise 3

Titus Kluits, the head of the Wellsboro Chamber of Commerce is reported in a local newspaper to have said of the school superintendent, Sara Hamilton, that she “lacks a sense of community”.

- A. Formulate several hypotheses as to why Mr. Kluits made that statement. Be sure to try to formulate **competing** hypotheses, if possible.
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Additional Questions (to be answered after all information is in)

1. What do you think the newspaper's editor thinks of the superintendent?
2. What is the dilemma Superintendent Hamilton finds herself in?
3. How large do you estimate Wellsboro to be?
4. Can you give a plausible fuller description of Titus Kluits?
5. How do you suppose the Chamber of Commerce views the School District?

Hypothesizing Exercise 4

Superintendent Janice Short at the opening Fall Board meeting of Hawthorne School District declares that the district is “rededicating itself to excellence.”

Student Directions

- A. Formulate several hypotheses as to why Supt. Short made the statement about the District “rededicating itself to excellence.” Try to formulate **competing** hypotheses, if possible.
- B. Can you combine two or more hypotheses within a more powerful hypothesis?
- C. For each hypothesis determine what information you would need to disconfirm its competitors.
- D. You will be given additional information. Use it to rule out some of the hypothetical alternatives.

Additional Student Questions (to be answered after all information is in.)

1. Characterize the students who are leaving the Hawthorne School District.
2. What relationship might there be between the “Partnership with Industry” and the opposition to homogeneous grouping in the high school?
3. What do you think is the attitude of the faculty toward homogeneous grouping in the high school, especially those who complain about grade inflation?
4. How secure does Superintendent Short feel in her job?
5. Edmund Spenser, CEO of a local firm, is looking to hire graduates of the School District. Does he favor the proposal for homogeneous grouping?

Additional Information (to be supplied by Instructor)

- A. The average SAT combined score for the district is 950.
- B. Enrollment has decreased slightly.
- C. Average household income for students has gone down.
- D. Members of the faculty complain about grade inflation.
- E. The Board meeting marks the start of a “Partnership with Industry” by the District.
- F. The PTO has vehemently opposed proposed homogeneous grouping for high school classes.

Student's Sheet

Hypothesizing Exercise 4

Superintendent Janice Short at the opening Fall Board meeting of Hawthorne School District declares that the district is “rededicating itself to excellence.”

- A. Formulate several hypotheses as to why Supt. Short made the statement about the District “rededicating itself to excellence.” Try to formulate **competing** hypotheses, if possible.
 - B. Can you combine two or more hypotheses within a more powerful hypothesis?
 - C. For each hypothesis determine what information you would need to disconfirm its competitors.
 - D. You will be given additional information. Use it to rule out some of the hypothetical alternatives.
-

Additional Questions (to be answered after all information is in)

1. Characterize the students who are leaving the Hawthorne School District.
2. What relationship might there be between the “Partnership with Industry” and the opposition to homogeneous grouping in the high school?
3. What do you think is the attitude of the faculty toward homogeneous grouping in the high school, especially those who complain about grade inflation?
4. How secure does Superintendent Short feel in her job?
5. Edmund Spenser, CEO of a local firm, is looking to hire graduates of the School District. Does he favor the proposal for homogeneous grouping?

Hypothesizing Exercise 5

Only three miles from prestigious Olympus Academy stands T.M. Penury High School. The teachers at Penury tend to fall into two groups: “traditionalists”, who accept no excuses from students for deviation from a strict academic code; and, “humanists”, who feel their primary goal is to make their students comfortable with school. The teachers at Olympus tend to fall into neither type, but are somewhere in the middle, expecting neither academic brilliance, nor tolerating even unmannerly behavior on the part of the students.

Student Directions

- A. Devise several competing hypotheses that account for the differences in teacher-type between Olympus and Penury.
- B. Can you combine two or more hypotheses within a more powerful hypothesis?
- C. For each hypothesis determine what information you would need to disconfirm its competitors.
- D. You will be given additional information. Use it to rule out some of the hypothetical alternatives.

Additional Student Questions (to be answered after all information is in.)

1. How can an equal measurement in two separate cases signify something different? Consider C and D, or E and F.
2. What kinds of criticism would a “traditionalist” teacher from Penury likely receive, were he or she to transfer to Olympus Academy?
3. Suppose a student received a complete scholarship from Olympus for his or her high grades at Penury. What difficulties might he or she encounter at the new school?
4. Which school likely has more students?
5. For top scorers on the SAT's, speculate about the relative motivation between the two schools.

Additional Information (to be supplied by Instructor)

- A. Average yearly family income for Olympus students is \$150,000.
- B. Average yearly family income for Penury students is \$10,000.
- C. Percentage of single parent families at Olympus is 50%; at Penury, 50%, also.
- D. 10% of Penury students take the SAT's, averaging 1250.
- E. 100% of Olympus students take the SAT's averaging 1250.

Student's Sheet

Hypothesizing Exercise 5

Only three miles from prestigious Olympus Academy stands T.M. Penury High School. The teachers at Penury tend to fall into two groups: “traditionalists”, who accept no excuses from students for deviation from a strict academic code; and, “humanists”, who feel their primary goal is to make their students comfortable with school. The teachers at Olympus tend to fall into neither type, but are somewhere in the middle, expecting neither academic brilliance, nor tolerating even unmannerly behavior on the part of the students.

- A. Devise several competing hypotheses that account for the differences in teacher-type between Olympus and Penury.
- B. Can you combine two or more hypotheses within a more powerful hypothesis?
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2. What kinds of criticism would a “traditionalist” teacher from Penury likely receive, were he or she to transfer to Olympus Academy?
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Hypothesizing Exercise 6

President James Avery at the opening Fall convocation of Hawthorne University, held under the Ancient Beech in the courtyard of ivy-covered Seminary Hall, declares that the University is “rededicating itself to the mission of its founders.”

Student Directions

A. Formulate several hypotheses as to why Dr. Avery made the statement about the University “rededicating itself to the mission of its founders.” Try to formulate **competing** hypotheses, if possible.

B. Can you combine two or more hypotheses within a more powerful hypothesis?

C. For each hypothesis determine what information you would need to disconfirm its competitors.

D. You will be given additional information. Use it to rule out some of the hypothetical alternatives.

Additional Student Questions (to be answered after all information is in.)

1. There is a move among younger faculty to stop having student evaluations used toward the awarding of tenure. Will Dr. Avery support this proposed change?

2. Is there much pressure felt by administration to institute a department of multicultural studies?

3. Is “excellence” a much discussed theme at Hawthorne?

4. What do you think the general attitude is at Hawthorne about pursuing government research grants?

5. Is Hawthorne most likely a public or a private university?

Additional Information (to be supplied by Instructor)

A. The average G.P.A. is 2.27 on a 4 point scale.

B. Enrollment has remained stable but endowments have gone up drastically as benefactor Ezekial Hawthorne VI dies leaving no heirs except the University.

C. Need for financial help for students has increased.

D. Members of the faculty complain about grade inflation.

E. The convocation marks the start of a fund-raiser by the University.

F. Suggested open admissions policies are opposed by alumni organizations.

Student's Sheet

Hypothesizing Exercise 6

President James Avery at the opening Fall convocation of Hawthorne University, held under the Ancient Beech in the courtyard of ivy-covered Seminary Hall, declares that the University is “rededicating itself to the mission of its founders.”

- A. Formulate several hypotheses as to why Dr. Avery made the statement about the University “rededicating itself to the mission of its founders.” Try to formulate **competing** hypotheses, if possible.
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Hypothesizing Exercise 7

After several months of escalating gang violence in the neighborhood, the principal of Madison High School has the police conduct a surprise yet thorough search for weapons late in the school day. Those found with weapons -- mostly knives -- hidden in their book bags or on their person tend to be among the best students academically.

Student Directions

- A. Formulate several hypotheses as to why those caught carrying weapons tended to be the academically more talented students.
- B. Can you combine two or more hypotheses within a more powerful hypothesis?
- C. For each hypothesis determine what information you would need to disconfirm its competitors.
- D. You will be given additional information. Use it to rule out some of the hypothetical alternatives.

Additional Student Questions (to be answered after all information is in.)

1. Has the average age of teachers at Madison been rising or falling?
2. Given that the principal is ambitious, has she been at Madison long?
3. Will weapons searches reduce the threat felt by many students?
4. Is there a student attendance problem at Madison?
5. What is the dilemma the principal finds herself in?

Additional Information (to be supplied by Instructor)

- A. The suspension rate at Madison is not significantly higher than the system average.
- B. State funding for the school district is based on average daily attendance.
- C. The average yearly family income for Madison students is \$8000.
- D. Madison students are members of a variety of ethnic groups, including many recent immigrants. Many students work as well as go to school.
- E. Teacher absenteeism is higher than most other high schools in the system.
- F. Built for 900 students, Madison has 1600 on roll.

Student's Sheet

Hypothesizing Exercise 7

After several months of escalating gang violence in the neighborhood, the principal of Madison High School has the police conduct a surprise yet thorough search for weapons late in the school day. Those found with weapons -- mostly knives -- hidden in their book bags or on their person tend to be among the best students academically.

- A. Formulate several hypotheses as to why those caught carrying weapons tended to be the academically more talented students.
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Additional Questions (to be answered after all information is in)

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Hypothesizing Exercise 8

Wilson University President Mila Sharp is away on sabbatical when the worst snowstorm of the decade swoops down on campus at 11 AM. The three vice presidents, equal in rank, are besieged with requests to close the University early and cancel evening classes. VP Simmons wants to wait to see how bad it gets. VP Harris thinks the governor might declare a snow emergency. Only VP Sanders, arguing that graduate students in the professional schools need to know early, presses for closing. When the other two VP's shy away from making a decision, he takes it on his own to announce the closing of the University.

Student Directions

Additional Student Questions (to be answered after all information is in.)

- | | |
|---|---|
| A. Formulate several hypotheses as to why there was hesitation about making a decision to close the University and why Sanders finally acted alone. | 1. What would the Head of Campus Security choose to do, if she had the authority? |
| B. Can you combine two or more hypotheses within a more powerful hypothesis? | 2. With which VP might President Sharp have agreed? |
| C. For each hypothesis determine what information you would need to disconfirm its competitors. | 3. What difference would it make if the Governor had declared a state of emergency? |
| D. You will be given additional information. Use it to rule out some of the hypothetical alternatives. | 4. What does this anecdote tell you about a career in administration? |
| | 5. Which VP is least likely to decide to close the University? |

Additional Information (to be supplied by Instructor)

- A. Sanders is 65 years old. He has been in his position for 6 years. Sharp is 60 and has been President for 8 years.
- B. Summer school begins immediately after Spring semester.
- C. Simmons and Harris are both 40 years old. Both have been VPs for about 5 years.
- D. When the University closes down, there are still 1500 undergraduate residents.
- E. Graduate students tend to be long-distance commuters.

Student's Sheet

Hypothesizing Exercise 8

Wilson University President Mila Sharp is away on sabbatical when the worst snowstorm of the decade swoops down on campus at 11 AM. The three vice presidents, equal in rank, are besieged with requests to close the University early and cancel evening classes. VP Simmons wants to wait to see how bad it gets. VP Harris thinks the governor might declare a snow emergency. Only VP Sanders, arguing that graduate students in the professional schools need to know early, presses for closing. When the other two VP's shy away from making a decision, he takes it on his own to announce the closing of the University.

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Additional Questions (to be answered after all information is in)

1. What would the Head of Campus Security choose to do, if she had the authority?
2. With which VP might President Sharp have agreed ?
3. What difference would it make if the Governor had declared a state of emergency?
4. What does this anecdote tell you about a career in administration?
5. Which VP is least likely to decide to close the University?

Hypothesizing Exercise 9

With Pennsburg State U faced with mounting maintenance costs, newly appointed trustee Roger Williams, a retired manufacturer, calls the Board's attention to research that shows that in schools whose graduates have the best GRE scores, lecture, often to very large classes, is the most common mode of teaching. He therefore recommends doing away with special labs and small group instruction at Pennsburg.

Student Directions

- A. Formulate several hypotheses about Williams' broader purposes in making his proposal. Is his argument sound?
- B. Can you combine two or more hypotheses within a more powerful hypothesis?
- C. For each hypothesis determine what information you would need to disconfirm its competitors.
- D. You will be given additional information. Use it to rule out some of the hypothetical alternatives.

Additional Student Questions (to be answered after all information is in.)

1. What is likely to be faculty attitude to Williams'?
2. What kind of student is Williams' son?
3. Unlike other universities in the state, the faculty at Pennsburg has not unionized. Is the likelihood of unionization increasing, or not?
4. What alumni support can Williams' count on?
5. Will Pennsburg State's President support Williams' proposal?

Additional Information (to be supplied by Instructor)

- A. Mr. Williams is a substantial donor to Pennsburg State. His own son attends Harvard.
- B. The State Legislature is debating reducing funding to State universities.
- C. Recently retired President Smith of Pennsburg State, who opposed an earlier nomination of Williams to the board, had changed admissions policies to be substantially less selective.
- D. Several of the oldest buildings on campus, more ornamental than utilitarian, will require substantial restoration in the near future. Some suggest tearing them down.
- E. Williams is a Pennsburg State graduate.

Student's Sheet

Hypothesizing Exercise 9

With Pennsburg State U faced with mounting maintenance costs, newly appointed trustee Roger Williams, a retired manufacturer, calls the Board's attention to research that shows that in schools whose graduates have the best GRE scores, lecture, often to very large classes, is the most common mode of teaching. He therefore recommends doing away with special labs and small group instruction at Pennsburg.

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Hypothesizing Exercise 10

The Public School Board of Metropolis, from a yearly one billion dollar budget, allots \$20,000 to each of 150 schools as a Principal's Discretionary Fund. Those funds are audited each year by a duo team of accountants from the prestigious firm of Laburnum & Woods. The firm charges the District \$200 per hr. and allots 50 hours to each school for checking the books. Since the Metropolis School District has no taxing authority, it must rely on a critical City Council for appropriations conditioned on a clean bill of health from Laburnum & Woods.

Student Directions

Additional Student Questions (to be answered after all information is in.)

- | | |
|---|--|
| A. Compare the cost of the audit with the amount of money audited. What hypotheses can you formulate about the outcome? | 1. What is <i>The Questioner's</i> perception of the relative worth of the public schools in Metropolis? |
| B. Can you combine two or more hypotheses within a more powerful hypothesis? | 2. A not-too-well-kept secret is that both major political parties appoint about 100 "ghost teachers" who receive paychecks but who work in no school. Why do school administrators not only tolerate this but keep it covered up? |
| C. For each hypothesis determine what information you would need to disconfirm its competitors. | 3. Why haven't teacher's union officials, even during a bitter strike, not exposed the appointments of "ghost teachers"? |
| D. You will be given additional information. Use it to rule out some of the hypothetical alternatives. | 4. How many dollars are spent on the audit to protect each dollar of "at risk" Principal Discretionary Funds? |

Additional Information (to be supplied by Instructor)

- A. Half of the 500,000 children living in Metropolis attend parochial or private schools.
- B. Laburnum & Woods, a generous contributor to both political parties in Metropolis, is the School District's general auditor, also.
- C. Several years back, a principal in a Metropolis public school was unable to account for \$5000 of discretionary funds. This occurred just as the Board requested a budget increase.
- D. Metropolis' largest newspaper, *The Questioner*, opposed that budget increase request and published the story about the missing money. Board incompetence was blamed.

Student's Sheet

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Hypothesizing Exercise 11

Will Wundt, the forward-looking school superintendent of Yarlborough, has instituted a new program of language instruction in the district, despite resistance from some of the older language teachers. He experimented first by seeking volunteers to teach the new program. Although cognitive outcomes for students were only slightly higher than those of students taught traditionally, measures of motivation and interest were greater for the new program. Dr. Wundt relishes his newly established role as an advocate for innovation.

Student Directions

Additional Student Questions (to be answered after all information is in.)

- | | |
|--|--|
| A. What is the likely hypothesis that supports Dr. Wundt's reasoning? Can you devise competing hypotheses? | 1. Linguistically and pedagogically knowledgeable teachers prefer the new language materials. However, they are dismayed with Dr. Wundt's experiment. Could you design a better one? |
| B. Can you combine two or more hypotheses within a more powerful hypothesis? | 2. Dr. Wundt is no fool. He deliberately avoided a technically more sophisticated research model. What do you think were his reasons? |
| C. For each hypothesis determine what information you would need to disconfirm its competitors. | 3. What is your prediction about the longevity of the new language studies program? What factors will influence it ? |
| D. You will be given additional information. Use it to rule out some of the hypothetical alternatives. | 4. Is acceptance of innovation in this case an indicator of openness or insecurity? |

Additional Information (to be supplied by Instructor)

- A. Grade point averages in foreign language were compared as a measure of cognitive outcome. Teacher enthusiasm was factored in to measure affective outcomes.
- B. The publishers of the new materials provided much additional support, e.g. language lab materials, films, etc. at no extra cost to the district.
- C. The experimentation involved in the adoption of the new materials provided the basis for Wundt's doctoral dissertation.
- D. Wundt's dissertation advisor often works as a consultant for the school district.

Student's Sheet

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Hypothesizing Exercise 12

Miss Morelli is dismayed to find out that some of the best students in her German III class, who have had her at least two years, have not signed up for German IV. Instead, they are filling in their rosters with notoriously easy electives. "Don't take it personally," one advises her. "You're a good teacher and we learned a lot. But we're being realistic."

Student Directions

- A. What is influencing the students' choice? Devise several competing hypotheses.
- B. Can you combine two or more hypotheses within a more powerful hypothesis?
- C. For each hypothesis determine what information you would need to disconfirm its competitors.
- D. You will be given additional information. Use it to rule out some of the hypothetical alternatives.

Additional Student Questions (to be answered after all information is in.)

1. If Miss Morelli's job depended upon her getting enrollment in German IV, what advice would you give her?
2. If you were Principal at Miss Morelli's high school what curriculum changes would you make if you wanted to raise academic standards?
3. Which groups of people involved with your school would resist your push to raise academic standards through curricular change?
4. How might college admissions policies influence secondary school curriculum?

Additional Information (to be supplied by Instructor)

- A. Many of Miss Morelli's students intend to be pre-med or pre-law majors.
- B. The high school Miss Morelli teaches in is in an affluent middle class neighborhood.
- C. This most recent school year, Miss Morelli gave 160 quizzes in 185 school days.
- D. Two complete years of a foreign language, though often preferred, is not required by most colleges for admission, nor by most high schools for graduation.

Student's Sheet

Hypothesizing Exercise 12

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Hypothesizing Exercise 13

In response to great public concern, the Synecdoche School District in conjunction with Synecdoche State University, launches a coordinated program expanding formerly perfunctory efforts in the areas of sex education and conflict resolution. The SEXCON program, as it is called, receives substantial private and governmental support. Two years later, Professor Dwight Ogenes of Synecdoche State undertakes a research program to evaluate SEXCON. He is dismayed at the resistance he encounters at all levels to obtaining basic data. He is strongly advised to accept a special grant for a more restricted study with travel far afield of his original undertaking.

Student Directions

- A. Why can't Ogenes get the data he needs? Devise several competing hypotheses.
- B. Can you combine two or more hypotheses within a more powerful hypothesis?
- C. For each hypothesis determine what information you would need to disconfirm its competitors.
- D. You will be given additional information. Use it to rule out some of the hypothetical alternatives.

Additional Student Questions (to be answered after all information is in.)

1. Sketch a model for evaluating SEXCON's effectiveness. What data **must** you have?
2. What might be an indicator of SEXCON's success?
3. Which parties are concerned with either the success or failure of SEXCON? Why?
4. Who is most likely supporting Ogenes' alternative grant offer?

Additional Information (to be supplied by Instructor)

- A. SEXCON advocates believe it will take at least five years for it to show results.
- B. Next year is an election year.
- C. Ogenes had only asked for pre-SEXCON statistics to begin his research.
- D. Ogenes' brother-in-law is running for the School Board.
- E. Ogenes is respected in his field as a researcher.

Student's Sheet

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Hypothesizing Exercise 14

The STUSORT, a nationally known set of secondary school achievement tests, is updated annually for statistical reasons to remove any items that more than 50% of those tested have gotten correctly. Despite test publisher warnings to the contrary, the School District of Agapolis uses the results of the STUSORT annually to rank schools relative to each other, to measure their improvement over the year and to reward their principals. Although the tests have been adjusted many times to be culturally unbiased, their use by the School District still generates controversy because among the school children of Agapolis, a strong correlation exists among STUSORT score, ethnicity and SES.

Student Directions

- A. What is the basis of this correlation? Devise several competing hypotheses.
- B. Can you combine two or more hypotheses within a more powerful hypothesis?
- C. For each hypothesis determine what information you would need to disconfirm its competitors.
- D. You will be given additional information. Use it to rule out some of the hypothetical alternatives.

Additional Student Questions (to be answered after all information is in.)

1. What objection can there be to using STUSORT to rank schools and provide incentive for improvement?
2. What are the consequences of using STUSORT to reward school quality?
3. The common explanation for the way schools are provisioned is racism. The reaction that follows is to target special efforts at the lowest level schools to counter this "racism." What is the likely effect?
4. What other ways of evaluating the schools would provide more incentive?

Additional Information (to be supplied by Instructor)

- A. Agapolis, an old city, has many *de facto* segregated public schools.
- B. In the public schools, the higher the segregation, the lower the SES tends to be.
- C. After several years of using the STUSORT to rank schools, no perceptible change in the ranking has been seen.
- D. Principals in low ranking schools tend to be removed, opening up positions for first time principals.
- E. Principals in high ranking schools are rewarded with job security, salary increases, more money and new programs for their schools.

Student's Sheet

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