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## *Easy Teacher: Prelude*

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*Love is the active concern for the life and  
growth of that which we love.*

ERICH FROMM

Once upon a time in Southern Arizona, there lived a teacher of science. Now this wasn't so unusual. But, this teacher of science had style. One could tell from the very first day in her class. Indeed, from the very first week.

Her name was Ms. Mack. Anyone who ever sat in her class on the first day of school didn't forget her. Some students didn't stay after one day or so, but they didn't forget her either. Those who did stay for the semester or more learned the full meaning of discrepant event.

It was junior high in a time when the ninth graders ruled the school. Some were sophisticated—"cool" they called it back then. They figured that after eight years of school and fifty hours of television a week—what could they learn? At least that's how I remember myself in general science at age thirteen.

Even for people as open-minded as my friend, Sherrie, and me, Ms. Mack was a shock. Only curiosity kept me in the class. I mean, would *you* stay in a class where the teacher had homework for the students the very first day, expected full participation, and told you there would be a special assignment on the last day of school? Really.

But, I'm ahead of my story. Let me begin with the first week.



Ms. Mack began that first day by saying, “I’m easy.” That’s what she said, but on each desk was a syllabus, an envelope labeled “Homework \* Do not open till 7:00 PM,” and a leaf. Yes, a leaf like from a tree or a bush. This was enough to capture a thirteen year old’s attention.

It was a small class. Only seven or eight of us. Due to the course description, perhaps. Ms. Mack called the roll. As she did this, she distributed packets to each of us with more “expectations” for the day’s work.

Each packet had a name. The names matched the students, of course. People looked at each other as this was going on. Silence filled the air.

Things had moved so fast that no one had time to really comment on her attire. Curious though it was. When all the other teachers were showing up in their suits, ties, first day best, here was Ms. Mack in a dashiki. It was filled with color; brilliant oranges, browns, greens, and she had a hat to match. She wasn’t wearing it. When asked why, she said she was being conservative on her first day of classes. Then, she repeated, “I’m easy.”

She pulled out a huge checkered handkerchief that looked like one I’d seen in “Little Lord Fauntolory”—the film with Freddie Bartholomew. Waving it o’er head, she said, “Open your packets, please.” Was this the Indy 500?



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## The Packet

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The packet was a heavy weight piece of construction paper folded in half and covered with some sort of plastic called contact paper. On one side was my name, Joan, and last initial, J. Sherrie was a few chairs away. She showed me her packet. It had the same design. The first name was in a boat. It looked like a banana to me, but I said nothing. The last initial was in the upper right hand corner and had stars around it. Ms. Mack called this “the education corner.” Someone dared to ask her what that meant, “the education corner?” She smiled. A first! Before that, she had been as sober as a judge.

“Delay of gratification is a characteristic of a good scientist. Later on, you’ll write that down, but for now, enough said.”

Sherrie looked at me and raised her eyebrows. I just shook my head. “What have we gotten ourselves into?”

The other side of the packet was a Picasso-like rendering of the five senses and some other symbols. One looked like a seesaw stick figure. No one said a word. It seemed an eternity with Ms. Mack standing there observing before anyone stirred.

Then someone snickered.

“Good!” she said. “For a moment I wondered if this group had enough energy and doubt to make good scientists. Scientists love questions. Let’s hear a few.”

Another eternity before Sherrie took the risk. Natural leader, that kid.



“What are these tabs for?” Sherrie was already taking things out of her packet.

“Looking ahead. I like that. First, how many tabs do you have? Scientists often think in specifics.”

“Four,” Sherrie replied, placing the contents of her packet on her desk.

“What else do you see on the outside of your packet? You have clues as to what we will study in the beginning of this semester. These clues are for making guesses. Good scientists like guessing games.”

A guy I didn’t know raised his hand.

“Yes, what do you see? And it would help if you’d pronounce your name before making your statement, please.”

He nodded. “Michael,” he said, grinning broadly. “I see a Brooklyn accent,” he sounded like Tony Danza himself. This brought laughter to the room.

“Four ‘Youse’” were printed in the center of the packet on the side with “Senses and Symbols.”

“Excellent observation, Michael. Hearing with the eyes is a bonus. You are correct. It was designed with Brooklyn in mind. Scientist Dr. Jean Houston, who has studied cross-sensing, would be proud of you. What else?” Another student raised a hand. “Yes, go ahead, please.”

“Robin, and I see four horizontal lines next to four letters of the alphabet.” These were located in the “education corner” on the “Senses and Symbols” side of the packet.

“Absolutely,” Ms. Mack said encouragingly. “Now, how about the inside? Besides the tabs, what do you notice there?”

“There are *four* cards!” I blurted out eager to participate. Ms. Mack nodded but said nothing. She seemed to be staring at me as she said, “Specifics, please?”

“Uh, they,” I began to stutter, “they look like three by five inch index cards. They are, are white with noth, nothing written on them,” I added a bit nervously.



Ms. Mack smiled but said nothing. When she raised her eyebrows, I realized I had forgotten to speak my name. “Joan, I’m Joan.”

“Good for you, Joan. Using specifics will help us get into quantitative work as soon as possible. And, sometimes scientists have to work even when they feel nervous or under pressure. What else?”

“There’s paper—oops!—my name is Kathy and there’s paper, white paper to be specific. Eight and a half by ten inches, I think. It’s blank paper. Two sheets of paper.” Kathy sighed with what appeared to be a feeling of relief.

“Eight and a half by eleven inches, I think,” spoke another student. “I’m Cal. There’s also a pencil—yellow, number two lead pencil about seven inches long. Anybody got a ruler?” He looked around to see. Another student spoke.

“Here’s a ruler and there is also a pen. My name is Ken.” Ken passed the ruler to Cal to check the measurement.

“I see you are catching on to the exact measurements factor in being specific,” Ms. Mack said. “Very good. Anything else?”

Michael raised his hand. Ms. Mack nodded. “What is the seesaw for?” He sounded like a persistent New Yorker to me. But I was glad he had seen a “seesaw” symbol too.

“Fair question. Let’s work a little now.” Ms. Mack sounded so mellow and relaxed, but I heard someone groan “on the first day?” Ms. Mack pretended not to notice. “Tools, please.” She held up a pencil and one of the three by five inches cards. “Yes, we work on the first day *and* the last. So, be prepared.” She smiled, but somehow we knew that she meant business.

Since everyone had a card and a pencil, it was impossible to play any distraction games. Most interesting.

Next, she turned on an overhead projector. “Please sketch a seesaw symbol on one side of your white card,” she demonstrated on a transparency as she spoke.

I was impressed. Not one person said, “I don’t understand.” A first day first!



Ms. Mack watched us for a minute. We watched her back since she used a stopwatch to time that minute.

“Next, you’ll have two minutes to write down all you can think of about seesaws. Pull your past observations from your preconscious and put them on your card.”

“Excuse me, please,” Ken appeared to be someone who wanted to get the instructions straight.

“One example?” Ms. Mack asked, even though it sounded rhetorical. “Seesaws,” she said as she wrote it on the transparency, “can go up and down. Be assured that anything you have noticed about a seesaw in your years of playground observations will be acceptable.”

“Could this be for real?” I wondered. “A question with only right answers?” A wave of the kerchief, a click of the stopwatch and we were off.

### “Seesaws”

1. can be made of many materials
2. can be found in parks
3. work best with people of equal weight
4. require adjustment for people of unequal weight
5. can be tricky
6. can be balance beams for one person’s play
7. can give my stomach a weird sensation
8. are often made in pairs (two or more seesaws in one place)

That was about it for me. I looked around. Some students were still writing. Some were finished and nodded to me.



Ms. Mack tapped on her desk. “Times up. Pencils down, please.” She waited a moment before going on to say: “Please print your name in large letters”—she again demonstrated on the overhead MS. MACK—“on the other side of this card.”

This we did.

“Now, get out of your desks and move around the room and meet your peers for this semester. Show them your name card. Double check for correct pronunciations. The topic for conversation is ‘seesaws.’ Any questions?”

All was silent.

“Oh, yes. You’ll have five minutes to gather data in this process. Scientists tend to be careful data collectors.”

With that curious remark, she waved her handkerchief. Click went the stopwatch.

“Move away from your desk, please,” she encouraged.

Slowly at first with lots of shrugs and questioning looks, we began.

It was amazing how fast that five minutes flew by. I barely spoke to three people before I heard music coming from the direction of Ms. Mack’s desk.

The overhead screen read: “*Time to be seated, please.*” We moved toward our desks. “What happens next?” I wondered.

The next message on the screen was: “*Test time!*”

If it had been quiet before, that was rowdy compared to the silence that followed seeing *those* two words on the first day of class! What in the world could we be tested on?

“Please take out a sheet of paper,” she began. “Print your name on the right side of the paper with the date underneath. If in doubt, please look at the example on the screen.”



In the top right corner she had written:

Ms. Mack

28, August, 1989—Log #1

“A log is another word for journal. Scientists record data. Please, draw a line down the middle of the page, and a line across the page, like this.” Again, she demonstrated. “The word for the left side is *content*,” she continued, “and the word on the right is *process*.”

\_\_\_\_\_content\_\_\_\_\_process\_\_\_\_\_

“Please show your paper to a person on either side of you to double check that we are working with the same diagram. Scientists want all procedures in a lab to be the same. This is a goal of empirical research.”

This we did. In this process, I met Judy who had been sitting next to me and had been quiet thus far.

“Take pen or pencil. In the *content* section, write all you can remember about seesaws. You may include a rewrite of your own list. Add anything you heard elsewhere. You have five minutes. Ready? Begin.” Click went the stopwatch.

The time must have flown. Before I could get to a place where I was searching my memory banks for more, I heard “Time’s up!”

“Please draw a line under your last entry,”

Ms. Mack had moved to the side of her desk. What was this? The woman was going to be full of surprises.

“Sometimes scientists need to take a short break from their work. Our work, so far, has included some listening, exchanging some information, and short term





memory testing. Taking a break can reduce blocks to creativity. Scientists are very creative people. Ideas circulate just like blood.”

“Was this a lecture?” I wondered as I stood by my desk.

“Raise your hands and arms above your head like this—she demonstrated—“for fifteen seconds. Watch for the clock’s second hand. Scientists use time in many of their experiments. Now is a good time for all budding scientists to get used to this. It may be important for your experiments in record keeping.”

So for ten seconds we watched in silence. At the very second time was up, Ms. Mack lowered her arms and began shaking her hands at the side.

“Please shake out the tension in your extremities. Only your hands for now, but”—and she began walking in place—“if you want to get more blood circulating—add the feet—your choice. Fifteen seconds more and we’ll continue with the test.”

There were a few shocked expressions. A few smiles as well. This was *not* the ordinary first day of school!

Fifteen seconds later, Ms. Mack sat on her bar stool next to her overhead projector. “Be seated, please!” When all was quiet, she said, “Continuing on the *content* side, please. List what you recall about anything identified or implied in class thus far regarding scientists.”

She wrote on the transparency: Scientists:—needs—work—characteristics, etc.

This must have struck a nerve in Michael. “Excuse me,” he said raising his hand, “were we supposed to be taking notes—*already*.”

Ms. Mack smiled. “Good point. Let’s all write that one down.”

“Scientists take notes. That’s one. Actually, Michael, this is a memory check. Your brain has had the input. Let it surface. You have five minutes to recall what *you* can. We’ll build on this later.”



What a test! So I took a deep breath and wrote, “Scientists need to be good listeners.” That was a beginning I grinned to myself. We’d see how all this turned out.

At the end of the time given, we each received a smaller packet. It was made of two five by seven inch cards covered in plastic. It looked like a home made pen holder.

It had a postcard of our area on one side. This quote by Feodor Dostoyevsky was on the other.

“Love all God’s creation, the whole and every grain of sand in it. Love every leaf, every ray of God’s light, love the animals, love the plants, love everything. If you love everything, you will begin to perceive the divine mystery in things. Once you perceive it, you will begin to comprehend it better everyday. And, you will come at last to love the whole world with an all-embracing love.”

Ms. Mack read it aloud.

“Does this mean we’ll have to learn great names in literature as well as science?” Judy asked.

“It’s a possibility since some people are—as you say on the rock music scene—cross-over artists.”

The class liked this.

“Look inside the pen holder.” I was correct! This was—a pen holder. Inside were strips of paper, each beginning with *scientists*:

“Check your list, please, with these.”

There they were. Individual sentences of everything she had said about scientists so far. Was this choreographed? Was every first day of school like this? I wondered.



After three minutes, we were called to attention again.

“How did you do?” Ms. Mack asked. Murmurs of *pretty good* echoed around the room.

“Will everyone be like this?” Ken had a need to know.

“Who knows?” Ms. Mack said with a shrug. “A lot depends on *you*.”

Ready for one more task before we talk about the homework?”

Some muttering about homework and the first day filled the air again before Ms. Mack turned on the packet.

E \_\_\_\_\_

A \_\_\_\_\_

S \_\_\_\_\_

\_\_\_\_\_ “Y”

“As I said, ‘I’m easy.’ *That* is a fact. Your task is to determine which words related to science can be used to fill in the space next to the letters. Some of you may have guessed that each word will *begin* with the letter you see printed there. Take out two of your three by five inch cards and put letters on each side—four altogether.” She held up the cards showing one of the four letters on each of the four sides.

E      A      S      “Y”

“Do we get an example this time?” Judy asked.

“No, you’ve graduated. Time for independent thinking practice.”

“How many more minutes?” asked Michael.

“Good quantitative question, Michael. Four. Ready. Pencils up. Begin.”



Madly, I wrote:

E—Experiment, exercise, exact, entry, examples

A—Absolute, average, anxious (I figured *some* scientists were anxious!), analyze, anticipate

S—Scientific method (after all she *didn't* tell us *not* to use two words!), search, seek, sum, satisfy, scholarly

“Y”—Then I came to the “Y”—“Yoicks, youth.” This one was tough and why was it in quotes, anyway. Being temporarily stuck, I gazed at the overhead. The “Y” was at the end of the blank—not the beginning! It was worth the risk. Why, sky, apply, try, pay.

“Time’s up! I notice our time today is running short, therefore return all the envelopes please. We’ll delay that task twenty-four hours and substitute another.”

“Can we open it first?” Sherry asked.

Ms. Mack shook her head “No” and asked Sherrie if she had “eager” on her list of “E” words. Sherrie did!

When the homework envelopes were collected, we heard the assignment.

“Select one each from your list of words and write a brief essay explaining how that relates to science or scientific studies. Spelling counts, so, look up any words that appear inaccurate. Legibility counts, so, make sure someone besides *you* can read it. Any questions?”

“Yes,” said Ken, “how long does it have to be?”

“Long enough,” Ms. Mack said with a grin. “To be brief.” Ms. Mack seemed to enjoy being vague and ambiguous.

We turned in our packets with pen, pencil and pen holder. Our last task was to pin our leaves to the cork board at the back of the room. This cork board had “Respect Me” at the top.

“Please notice where you have placed your leaf on the cork board. We shall be working with them in tomorrow’s class.” That curious remark ended the class



as the bell sounded.







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## Mahler's Ninth

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*The very spring and root of honesty and virtue  
lie in the felicity of lightning on good education.*

PLUTARCH

**H**ere it was the second day of the first week of this science class, and I was about to be late. There was no way to get out of gym class early. What could be my fate?

All this and more filled my thoughts as I rounded the corner and saw Sherrie and Ken by the door. Relief! They held the door for me as the bell sounded.

“One minute, Joan! You’d better watch it or we’ll scientifically observe what happens when someone is late to this class.” Sherrie looked as though she would be glad to see me as the guinea pig for that experience.

“Yeah,” Ken said, “did you get your homework?”

“Of course,” I replied breathlessly.

We were soon all in our places with the anticipatory bright shining faces of the totally confused when Ken asked, “Where is she?”

Sure enough, the room had the same students from yesterday plus one more. But, no teacher. There was music playing. Something classical.

Michael went to the cork board to retrieve one of the leaves.

Cal questioned this. “Are we supposed to do that?”

“Why not? Michael said with a shrug. “Did you do your homework?”



Before Cal could respond, the new student reacted with alarm. “Homework!? You mean you had homework on the first night of school?”

Before anyone could say another word, the last bell rang and the room went dark.

“Who’s the wise guy?” Ken asked.

“I am the wise woman,” came a voice over the speakers, “your teacher, Ms. Mack. Good to see you are all here on time.” The lights came on. While you get your leaves, I’ll meet this young man.”

Andy was the new student. He appeared to be the personification of bewilderment. Ms. Mack gave him a packet and a leaf. He sat at the front of the room.

“Mahler’s Ninth,” she said as she wrote this on a clean transparency. That’s the music of the week. Anyone want to guess why?”

Not a hand went up.

“What? No guesses? Come on. You’ve been here two minutes already. You can guess about anything.” By now we all had our packets and materials for work. “How about,” she continued, “if you use your remaining three by five inch card for guesses. Please write that on one side.” She wrote this on the overhead.

In the packet was something new: a piece of clear contact paper. I could feel the curiosity rising in my veins. On top of that, I noticed that a poster was added to the room. It was a picture of a businesswoman with a cartoon caption, “Lysiphobia is *not* terminal.” What could that mean?

Ms. Mack was helping Andy with the task. “All you have to do is guess. After all good scientists traditionally work with guesses only they call them—what?”

At last a question that makes sense to me and to a few others. That “aha” look filled the room.

“Hypothesis!” Robin called out.

“Absolutely,” replied Ms. Mack. “Just write down any old hypothesis and we’ll go to work.”





The music ended as I wrote:

“The guy wrote a total of ten pieces of music. She’s listening to them in sequence.”

Next, we were organized into groups of three. “Trios,” Ms. Mack called them. This was when it became obvious that this was a small class. Someone nearby said something about this being titled the “Out of the Ordinary Science Class” and speculated that might have something to do with it. Teenagers may not be willing to risk taking some “unknown” class when everything that’s going on already seems different in a large junior high school. No sooner had we begun to muse about these things among ourselves that the overhead posted the “task.”

“Take out your *homework*, please.” Ms. Mack gave us thirty seconds on the time to get ready.

“During the next six minutes, you will read your essay aloud. I trust you have taken the previous lapse in time to greet each other. Andy’s group will take the first two minutes to fill him in on this homework assignment. Decide who will go first. Naturally, to ensure fairness, I will time the two minutes for reading. It may not take two minutes. Therefore, use the rest of the time to make sure you understand the reader’s essay. Scientists often read papers reporting their research to their peers. Therefore, this will be good practice. I’ll give you thirty seconds to decide who will begin.”

Kathy and Sherrie were in my group. Needless to say Sherrie was going first. Kathy was also eager. I decided to go last. “Next time I’ll be more assertive and suggest we draw lots or something,” I thought to myself. This was some group—each person wanting to read first.

“Time. Ready? Begin.” Sherrie was off! She had chosen “experiment”, “analyze”, “search” and “yesterdays” to complete the acrostic. Kathy and I listened to her reasoning. Excellent as usual.



Kathy went next. She had noted the position of the “y” and used “apply” for the “y” word. Her others included “experiment”, “absolute” and “senses”. My pulse rate was increased in anticipation of my turn to read and the hope that my peers would like my essay, too. “Comparing one’s efforts with others might not be in one’s best scientific interests. Public or semi-public scrutiny by peers may stimulate building blocks of knowledge from insights gained over the years. I was prepared.” These thoughtful reminders surfaced as I began to read: “E—Exactness, A—Anticipate, s—Scientific Method, ‘y’—Try, are words that can compete the EASY acrostic.”

One of the great challenges in scientific studies is *exactness*. How far is it to the moon, the Sun, etc. Can the Universe be measured? Science is filled with numbers. Scientists don’t even like to round them off as anyone who has worked with  $\pi$  knows.

Scientists, who may at one time have been involved in dual careers as philosophers or mathematicians, tend to *anticipate*. This anticipation has often been called intuition. Most of the early “I thinks” were based on observation and simple experiments to work with these hunches. Still, the thought, the hunch, the guess preceded the experiment.

The *scientific method* with its vast opportunities in trial and error is the prime intellectual tool for the scientist. The hypothesis, the methodology to test it, the results and discussion of implications and suggestions for further study are the major segments of the scientific method.



Lastly, the not so easy part of the scientific quest is found in the word *try*. This is what scientists must do again and again and again to add to the total body of knowledge used by scientists everywhere as they struggle to fulfill the quest for 'truth' in universal problem solving.

Kathy and Sherrie liked my essay as much as I enjoyed each of theirs. We spent the rest of our time wondering aloud about which words the teacher had chosen.

"Time!" was called cutting our discussion short.

"That's step one." Ms. Mack had our attention. "Step two is to select one essay from your group to be read to the total class."

"That's a surprise," Kathy whispered. "How will we choose one?"

"Each one had a merit," Sherrie added with a puzzled expression on her face.

"Simple," I said, "We put our names on slips of paper, fold these, and draw one. That person reads her essay."

They nodded. Naturally, mine was chosen.

Each person had to go to the front of the room. Each read his/her essay. It was fascinating how many different words could come in these three essays. Ms. Mack listened to each with nodding approval. At the end, she led the applause for the writers.

"You may as well get used to this now," she said, "as scientists deserve recognition for their efforts. Please be seated. In your materials from yesterday you will find your test. Please take it out for further work."

The diagram on *content* and *process*?" Judy asked.

"Exactly right." Ms. Mack gave Andy a prepared page with the diagram.

"You had a test on the first day of school?" Andy was incredulous. "What about?"



Cal was seated next to Andy. He reassured him that it was more of a memory check than the kind of test that rings alarm responses in students. Just then, Ms. Mack further reassured Andy by giving him the list of scientist's qualities that had been mentioned or implied.

"A little review. Yesterday, we worked with the day's input, seesaws and scientists, the content side of our work. Who can tell me what questions might be asked for a 'content test' for today?"

A few moments of silence can seem an eternity in a class that has set a standard for a moderate to fast pace. Nonetheless, Ms. Mack waited. Judy, who was known to be an enthusiast of "Jeopardy" took the risk. "List words that you have heard as possibilities to link the acrostic, EASY, to the study of science."

Andy was impressed. "You're kidding. You really thought all that up?"

The class laughed. Andy was going to be good for morale.

"I have one." Sherrie wanted to get in on this. "Who or what is the name of the new student?"

"How many essays were read aloud in class today?" Ken liked those quantitative questions.

"I can hear that you have a handle on this task. Excellent." Ms. Mack was one who liked to keep things moving. "Each one is an example of a 'content' question. How about some 'process' work now?" The question sounded rhetorical. It was. Ms. Mack was on a roll. "You were just organized into your Wrt formal small groups. Any reading of Nobel Prize Winners for any year might reveal a fact or two about the need to work, collaboratively, in small groups. It was Newton who spoke of 'standing on the shoulders of giants.' Such is the nature of scientific exploration. In groups, leaders suggest a format, a way of getting the task accomplished. In line with our gaming and competitive culture, someone might even suggest a strategy for 'fairness' in a group decision, like 'Who will read his or her essay Wrt?' Regardless, the how of the task is the 'process.' On a clean sheet of



paper, please write a paragraph on the process you observed in your small group.  
Label this paragraph

*Participant Observer #1—Process on ‘EASY’ Essay.”*

Once again the overhead gave the visual for reassurance. Ms. Mack had more to say about this assignment.

“Be aware. This paragraph will be graded for punctuation, spelling, and grammar. One error is all you are allowed without a reduction in grade. Two errors and an ‘A’ will become a ‘B’, etc. Any questions?”

“Comma blunders, too?” Ken looked shocked.

“Some people are in love with commas, Ken. If I see this romance going too far, we’ll have a lecture from the student teacher in the English department on the subject. Your already acquired knowledge on good paragraph construction will suffice for now.”

“Thank you,” Ken sighed and breathed a little easier. He certainly valued correctness.

“This paragraph will not be timed. Feel free to sketch an outline or notes in your margin. ‘Mahler’s Ninth’ will offer some soft background for concentration. When you finish, please pay close attention to your leaf. Notice the details in its compositions, the veins, color, etc. Inspect it. Name it if you want. Prepare—mentally—to sketch it when everyone has finished the process writing task. Comments? Questions?”

There were none. We began.

Writing a process paper is not the easiest thing to do. First, I decided to stop, to think, to make some notes.

What *did* we do?

How much *detail* was expected?



What about the grammar thing?

This was no checklist or multiple choice test. I had to think. Weird science class!

In what seemed like no time at all, the music stopped. It had been fifteen minutes. It felt more like five to me.

"This will give me the base line information." Ms. Mack was collecting the papers. Reading these will give me some idea of what to expect for future writing tasks. Date and name on each paper, please." Nothing like a reminder to do the obvious.

"Sketch #1: Leaf" appeared on the overhead. "On a sheet of paper, please print this title. As soon as you have checked to see that your tool, a pencil, is sharp, you will sketch your leaf. Again, include as many details as possible. You may even label the colors."

Little did we know this was the beginning of a notebook of drawings. Ms. Mack claimed that if sketches were good enough for Leonardo da Vinci, they were good enough for us. "Definitely a *can do*," she said.

Sketching was fun. As each person finished, Ms. Mack gave them a piece of clear contact paper and a dime.

"What's this for?" Judy asked Sherrie as she flipped the coin above her desk.

"Who knows? Maybe we'll pool our money and buy a telescope."

"Good idea, Sherrie," came the voice of Ms. Mack from across the room. "Perhaps we will someday."

This was how we learned that this teacher could hear very well.

"Earlier in the day, each of you had made a guess about 'Mahler's Ninth.' Please locate that card. If you will hold it in the air when you locate it, I'll be able to see when we can move on." When the nine cards were in the air, she said: "How about a guess related to the use of the dime and the contact paper?"

Ken was quick to respond. "I think."



“Writing first, Ken, please.” Ms. Mack had a certain sequence for tasks. “Scientists make notes,” she continued. This was definitely becoming the norm.

“Guesses: We are going to cover our leaf for posterity. The dime is for use in a lab on odds.”

That was enough for me.

We then located our name tag cards. Andy printed his name on a clean three by five inch card while the others waved in the air.

“Your name is on one side. The other, the seesaw side,” Ms. Mack was demonstrating as she spoke, “will now be recycled. Put your leaf on the card and cover it with the contact paper. The instructions for the contact paper are on the paper itself. Take your time.”

“What’s that?” I’d gotten lost and had to ask. “Could you repeat the instructions, please?”

“Yes. May I use your card to demonstrate?”

“Please do,” I responded.

Ms. Mack took my card *and* leaf.

“First, place your leaf on the card. Remove the backing from the contact paper. Put the contact paper over the leaf and fold down the sides of the contact paper. You may use the scissors to trim the edges.” The scissors were located in the central “tool area” on Ms. Mack’s work station. It was covered with red contact paper. This made it easy to locate tools and to *return them* when we were finished.

Once mine was finished, I was free to help others get their cards in order.

Ms. Mack went on. “Please pin your name tags to the cork board when you’re done. We don’t want to be rushed at the end of class today.”

End of class! It couldn’t be. That time really flew!

The “homework envelopes” were waiting for each of us as we returned to our desks. The same envelopes that we had turned in the other day before. The overhead was humming again. *Contact* was written there.



“On the outside of your envelope, please write ‘contact.’ In addition to the homework you will find inside the envelope tonight at 7:00 PM, please stop by the library and look up authors of books that are titled ‘Contact.’ A hint: There are at least two but you may find more. This will serve as a beginning research task.”

“What’s *in* the envelope?” Andy asked Robin, who was preparing to go.

“You’ll find out at 7:00 p.m. tonight. It’s a curiosity test,” she whispered. “Ms. Mack,” she continued, “what about this dime?”

“Ah, yes! I was hoping someone like you, Robin, would make sure we dealt with that today. It is for *two* things.” Ms. Mack appeared to be enjoying this more than anything else so far. “One is this.” She lifted her handkerchief to reveal a can decorated with our names. When does she find the time, I wondered.

“If you had a nickel for each skill you might learn in this class and others, you would see how very ‘wealthy’ you might become. For example: Today, number one, you have read aloud; number two, you have sketched a leaf, easy necessary skills for any student of Natural History. Five cents plus five cents adds up to a dime. We will keep our earnings in this *can do* container.” She moved about the room collecting the dimes.

“That’s one reason,” Michael, but the bell is about to ring. We’ll delay the answer until tomorrow.”

*Ring!!!*

6:30 PM

6:30, 6:35, 6:40, why not open the envelope early? Who could know why not? Conformity, perhaps. There I was waiting for the clock to touch 7:00 o’clock. “Patience, a characteristic of scientists,” I reassured myself.

6:55, 6:59—*now!* Here it was, “The Assignment.”





### *The Assignment*

This assignment appears to be easy. Be aware that it will ask you to be a scientist, just as Aristotle, Democritus, and Archimedes. They worked with *observation* skills, some calculations, and recorded their ideas.

The goals of this assignment include:

1. Accuracy
2. Discipline
3. Task Persistence
4. Data Recording
5. Developing Conclusions (essay writing)

#### *Time*

Choose a time between 7:00 and 8:00. This time must be the same each week. Your data gathering will take place every seven days at *exactly* the same time. If you were able to discipline yourself to the time—waiting for precisely seven o'clock this evening—you are moving along the path of the scientific skill that give due respect to *exactness* and timed experiments. Pat yourself on the back!

#### *Space*

Choose a place outside your dwelling. Each week you will stand or sit in this same place. You will gather the following data:

1. Temperature
2. A sketch of the horizon including geographical references,



details regarding colors, shadows, etc.

3. Record the direction you face with a compass. You will face this direction each week.
4. For your work to be empirical, each of your procedures will be the same. Example: If you take the temperature first one week, then do this first the next week and the week after that. It may help you to list the steps in your procedures to guide you each week.
5. This is a solitary assignment. Have no other persons with you as you “walk in the footsteps” of these earliest scientists. Autonomy in data collecting is important.

#### *Recordings*

1. Use plain notebook paper. You can design your own graphs, charts, etc.
2. Use pencils.
3. Keep all data, sketches in a notebook that contains no other material.
4. Find a place to secure this notebook so that you will be able to locate it each week.

Whew! How many notebooks would it take for this one class? It appeared that we would learn that scientists had a penchant for being organized.

Decision time.

*Time?* 7:45 would be “my” time. By that time my family duties would be completed. Each Tuesday at 7:45, I would be guaranteed time alone—outside. Could it be that other students with younger siblings might find relief in such a designated task? This would also give me time to finish my observations before the



phone curfew went into effect. Sherrie and I could compare notes! Part of the designated task to be included in my procedures.

*Space?* There was a corner outside my bedroom where the wind didn't blow. This would be practical for a task that required paper and pencil. It also had a view of the mountains where I could observe the changing seasons and the setting of the sun. It was already approaching twilight. Later there would be more stars in that part of the sky. Maybe I could find their scientific names.

*Temperature?* We had no thermometer in the house. It was a pattern for our family to listen to the community's morning news. A lady habitually called in each day to give the local temperature. Now, I might be learning about that type of habit formation, only at night. This week I'd have to guess at the temperature. Flashlight? Might as well add that to my list of "needs" for science class.

It had taken only fifteen minutes to make the sketches and get things in order for this assignment. It was now time to check with Sherrie before phone curfew.

I wondered what we would eventually learn from this?

It looked easy enough.





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## *Discrepancies & Skepticism*

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*A great teacher never strives to explain his  
vision—he simply invites you to stand beside  
him and see for yourself.*

THE REVEREND R. INMAN

The classmates gathered outside the door before the first warning bell sounded. Eagerness? Perhaps. The chatter indicated some anxiety about the assignment and the age old question, “Did I do this right?”

Some people had thermometers. Some did not. We would soon find out if we had to be *exact* on the first attempt. Ms. Mack greeted us at the door.

Shock! What was this? Here she was with a big smile and even bigger glasses on her nose. She said nothing as we filed in. She called our names in a dual checking of the roll and a returning of our leaves. By now, we knew to look around. To be ready for the something different that would become the norm. There it was. “Unfinished business” was on the overhead projector. No doubt this was to be one of the topics of the day.

“Journal writing time begins now. You will have five minutes.” Ms. Mack believed in using the time as she established the norm for writing at the sound of the last bell signaling the beginning of official class time. Five minutes to write anything I wanted as long as I dated the pages. Five minutes to just sit and get ready—mentally—for the 45 minutes ahead. Five minutes for the teacher to pre-



pare for us? I wondered what her last class did today? I had already heard that each was different. Enough wandering through the gray cells. The lights flashed letting us know four minutes had passed. Quickly, I sketched a picture of Ms. Mack's giant glasses. Not something to be omitted in a beginning observation journal.

"Before we begin today's work, let's review some of the questions posed thus far." Ms. Mack moved her glasses from the bridge of her nose to the top of her head. This was amusing to more than a few of us. I wondered if she had a touch of "ham" in her.

Several students made an effort to stifle a giggle, unsuccessfully.

"Excuse me?" Ms. Mack asked as she put the glasses back on her nose.

Silence.

"Is there something humorous in preparing for today's questions?"

No one moved.

"Very well, let's go on." This time she moved her oversized spectacles to her forehead which made her look like the cover of a sci-fi book.

"As you can see, the opening topic today is unfinished business. This term may be familiar to you. If we start something one day and do not finish it, that topic or subject goes under the heading of 'unfinished business.' Any questions? It is safe to ask anything."

"Yes, the glasses on your forehead. Do they have something to do with class today?"

"On my forehead?" Reaching up, she pulled them off to hand to Cal. "These?"

Cal accepted them and nodded.

"Very well, we will put the glasses on the list for unfinished business. What else?"

Cal was bewildered. "You won't tell us *now*?"



“That’s correct, Cal, but I *will* tell you before the class is over. More unfinished business?”

After a brief silence, Ken jumped in. “We need to talk about our assignment.”

“Yes. What else?”

“The research task.” Sherrie had succeeded in finding the books and wanted to find out if they were the right books.

“Yes, what else?”

“The education corner.” Cal was up and at ’em today.

It seemed to be taking a while for the rest of us to catch on to this listing task.

“Grades.” Ken said emphatically, “I want to know how grades are determined in class.”

“The dime, how about the dime?” Michael asked.

“The dime,” Ms. Mack repeated, “anything else?”

“Yes,” added Michael. “*Specifically*, it’s other use or meaning?”

“Wait a second. Wait.” Ken spoke up.

“Yes?”

“Can we put any questions we’ve had about this class since the first day?”

“Yes.”

“What’s the meaning of Mahler’s Ninth?”

“You have a hypothesis related to its meaning?” Ms. Mack smiled at Ken.

“Yes,” replied Ken emphatically.

“Very well. It makes the list. Anything else?”

“Will we have to read books in this class?” Robin wanted to know.

“Will we have films?” Kathy asked.

The group was coming to life with nods and “yeahs.”

“Unfinished business,” Ms. Mack spoke deliberately, “does *not* include future questions. We are listing just those things that we have not finished or explained in detail that have already come up in class. While those questions have merit



and your eagerness is appreciated, we will finish *this* task before discussing expectations for learning option sin this environment. Does that sound reasonable?" We nodded and gave accommodating grunts whether we agreed or not.

"Very well. Judy, would you please read the list for unfinished business identified thus far."

"Yes, glasses, assignment, research task, education corner, grades, the dime's other meaning, Mahler's Ninth."

"Excellent, a good beginning. Will you please take out three sheets of paper for note taking today? I'll continue while you prepare. If you need paper, you will find it under the cork board that says 'Respect me.' If you need pencils, you'll find freshly sharpened ones near the overhead projector. After today I'll expect you to have materials ready by the time the tardy bell sounds. Make note of your needs. Some time when you can afford it, please, replace paper and pencils so our supply will maintain itself. Besides note taking materials, be sure to take out your assignment from last evening. Any more questions before we have two minutes of preparation time?"

"Yes," it was my turn to add something. "Could we add 'Respect Me' to the list of unfinished explanations?"

"Absolutely!" Ms. Mack smiled as she added one more item to the list. Anything else?"

"One more!" Judy looked excited as she added, "How about the words that you think are best for 'EASY' acrostic?"

"Yes, yes, yes," others chimed in. "How could we have overlooked that!" I wondered.

"All right, that will make a total of ten items. Enough for a small lecture today."

Two minute warning! Prep time. The music began.





Since I had paper and pens for writing, I watched Ms. Mack. She was listing “Expectations” on a huge piece of newsprint. After she wrote the word “grades,” she covered the writing. Where was her chalk?

“Again, date your notes,” Ms. Mack began. “This will help you locate ideas in the future. Ready?”

“The glasses are a discrepant event. Lots of people wear glasses but these glasses,” she waved them around, “got your attention! Did they not? A *discrepant event* is an ordinary something/someone who appears extraordinary. Discrepant events make us pay attention, look twice, etc. They are unexpected. Another easy example is the trick birthday candle that won’t blow out.”

“Yes” came from all parts of the room.

“One of your pages will be titled, ‘Quotes.’” Ms. Mack wasn’t going to slow down now. “On that page, center the title,

‘Quotes’”

She demonstrated on a transparency.

Mary Budd Rose: “There is a pattern to all behavior, but there is uniqueness in the pattern.”

“A discrepant event can occur in nature. For example, Ann Boleyn had six instead of five fingers.” Ms. Mack continued. “Questions?”

“Yes,” blurted Cal, “Will we be skipping around like this often?”

“Be specific, Cal. What exactly do you mean?”

“We were taking notes on one page and then you asked us to begin another page for ‘Quotes’. Will this be a norm?” “Probably, but since you do this naturally



in conversation, you will get used to it sooner than you think. Besides, we'll start *slow*." Ms. Mack paused until it became almost uncomfortable.

When we started looking at each other, she said, "Ready."

"If you find a discrepant event, please bring it to class. You get special credit for these. Please note that Dr. Gil Dyrli, University of Connecticut, knows about these events." Citing sources is a good habit. Besides that, it stimulates memorization and it's honest.

"Assignment—the first week's assignment is another way to check your writing. The first one will be ungraded—officially. Unofficially, you will receive two grades. One grade will be for accuracy in reporting. I will be looking for *details*. Where you position yourself. Do you stand or sit? The more details, the more each week's observation methods can be exactly like the last, the better. You can imagine that this grade will count more than the grade for grammar."

Judy howled! "This isn't an English class!"

"She is right." Andy spoke now. "As long as we communicate our ideas, we should get a grade for the work."

Ms. Mack rapidly replied. "Lucky for us! Benjamin Franklin believed it was wise to learn to write or we wouldn't have so many experiments in elementary electricity to enjoy today. *Other* reasons will surface as to why this is important in this century. Till then, it *is* an expectation."

Ms. Mack could give the evil eye. This she did as she said "expectation." So, back to basic grammar! Yuk.

"Furthermore, if you haven't encountered Ernest Hemingway's writing on trout fishing or the description of the education of a sausage fly in the 'Winds of Mara', pages 88 and 91, I suggest you find one or both to pique your awareness and appreciation of detailed description. It is my understanding these are classic descriptions."

"How do you spell Hemingway, Ms. Mack?" Cal asked.



“For spelling, first check with one of your neighbors. Second, if they don’t know, then put it in the margin for review during work time. Third, I will be available if you haven’t found it before then.”

“Will ‘work time’ be explained today?” Cal persisted.

“Yes, it will. Moving right along.” Ms. Mack put another transparency on the overhead projector.

*Research Task*

Contact: The First Four Minutes

by Zunin

Contact by Carl Sagan

“How many found these two books?”

Sherrie and about four other students eagerly raised their hands.

“Very good. Please put this writing with your assignment to be turned in today. Everyone else make note of the names and book titles. At the end of this week, you’ll take these names and any others from your notes to be listed in a special section of your notebook.”

“Notebook?” Michael almost whispered.

“Yes, we’ll talk more about that when it comes to *grades*.”

“If you read the book, *Contact*, you will find one meaning for ten which is represented with the dime. You have received one dime each already. If, when you check yourselves at the end of class today, you find that you have begun number one, to categorize and organize pages for your notebook and number two, turned in your assignment *on time*, you’ll have another dime for our collective *can do* container.”

“Now, about ‘Mahler’s Ninth’—two things intrigue me here. Maybe three—you be the judge. Number one—Mahler’s Ninth is part of a book title. The au-



thor is Lewis Thomas, M.D. He writes essays, has been in medical research and has several books in the library for your enjoyment.”

“Do we have to put him in the bibliography?” Kathy asked.

“The wisdom to ask the question gives you a hint as to its answer.”

“Yes, we do,” Ken whispered to Kathy.

“Number two—classical music is excellent background for studying. The three B’s—Bach, Beethoven, Brahms—nourish your brain while you work. Be good to yourself. Begin early to work with these to get the most from your study time. Some are available on cassette in the library.”

“What next?”

“Wait, wait;” Ken, the observant one, wanted more, “you said ‘three;’ that is only two.”

“Good ear, Ken,” Ms. Mack smiled. “I heard on National Public Radio that Mahler’s pieces of music which are numbered one, two, three, etc. were all written at the same or nearly the same developmental level. In other words, musicologists can study symphonies and see the growth and the changes in the composing style. With Mahler, this isn’t so—his music seems to be all at the same level of maturity. By contrast, Tchaikovsky, who began a career in a law office—can you imagine?!—and later switched to composing in his mid-twenties, worked and re-worked his First Symphony, but it does not have the impact of his latter works. Maturation is an interesting phenomenon in science as well as music.

Some scientists are like Mahler. They work on one question. Progress may be slow. Others make leaps that unlock vast numbers of nature’s secrets. Every effort contributes to knowledge. Music appreciation and scientific appreciation have some things in common.”

I couldn’t help it; this was too much for me, so I asked “Will we study music too?”



Ms. Mack laughed! “*Not* in detail, but we will use it to our advantage and I do expect you to know that somewhere out there in space Bach’s music is playing. Why? We’ll discuss later.”

“What’s next?” Ms. Mack asked as she checked Mahler off the list.

“The education corner!” Cal was definitely interested in this.

“Very good. Let’s put the ‘education corner’ and ‘Respect Me’ together. It’s a corker anyway.”

Was she trying to make a pun?

“Cork builds up one inch, one foot at a time, over many, many years. Don’t ask me *how* many. I’m the one asking questions today. I can tell you that I find much information in and entertainment from ‘2201 Fascinating Facts’ by David Louis. You can read it at your leisure in the library. It is in the reference section. It is also on the first week’s suggested reading bibliography mentioned before. Cork is unlike people. Some individuals pop their cork,” she said as she drew a circle and a square on a clean transparency. “Some people can float like cork, some people can stick to your memory as easily as your leaves adhere to the cork board with one small pin, Now, looking at these, we’ll begin with ‘Respect Me.’ Placing a ‘t’ in the circle, like this, [INSERT PIC 44], we now have four sections. The memorable Dr. Michael Giammette taught me this.” She put his name on the transparency under the circle. Inspect [INSERT PIC] or to look closely at it is one skill of the scientist or any human being for that matter. Sometimes people like to separate science from their lives. In this class, we will *attempt* to integrate many areas of enlightenment, science is only one, into our thinking processes. So, first, we inspect. Second, [INSERT PIC] Respect. Scientists *respect* their areas of study. They *care* about learning, studying, questioning. They want to know about things—in general and in particular.”

“So, that is the respect me part on the cork board,” Robin interjected, “the board held our names and our drawings of the leaves? Is that the connection?”



“Is that your conclusion, Robin?” Ms. Mack looked solemn.

“Yes,” Robin nodded.

Smiling, Ms. Mack replied, “It makes sense to me.”

“Is there a reason for everything in here?” Ken inquired.

“Hypothesis or conclusion, Ken?” Ms. Mack was still smiling.

“Both,” Ken hedged his answer.

“Time will tell. May I continue?” She seemed to ask this of Ken. He nodded.

“Well, that’s enough of Giammette’s Speçt Family for now.” She put her huge glasses on her nose again. “Puts a whole new meaning into ‘here’s looking at you, *kids*,’ doesn’t it?” Ms. Mack seemed to laugh at herself. I felt comfortable with teachers who had a sense of humor.

“Will we finish the other two sections today?” Kathy asked.

“You people really like to know the answers, don’t you?”

We all nodded!

“With your permission, I’d like to save these two sections of the ‘Speçt Family’ for next week when we prepare for a visit to the computer labs. They will fit nicely into the storage and retrieval concepts of the computer as well as the brain. Agreed?”

We readily agreed and felt energized with the news about the computer lab.

“The square is next. To meet your needs for completing the task, I’ll cover all four areas of this square that is called the ‘Johari Window’. The Johari Window is the brainchild of behavioral scientists Joe Luft and Harry Ingram, who endowed it with their names. Makes it easy to remember. The window panes represent a giant window of opportunity related to growth and learning. They are divided like this into four sections:



[INSERT PIC 46]

1. Window pane number one is information everyone knows. Example: We each know the number of people in this classroom.

2. Window pane number two is information *someone else* knows but you do not know. It is called the feedback window. Test scores 'live' here among other important news, like if you read an essay and your peers like it they will tell you. There is a great deal of feedback in science as well as in life,

3. Window pane number three includes information *you* know but others do not know. When you tell them, this is called 'disclosure.' Example: Only you know what areas of science interest you at *this* moment. If you tell another person, then you can discuss more. Giving information and receiving feedback. You might even find a peer researcher.

4. Window pane number four is information *no one* knows. The dreams of today may become the realities of tomorrow. This is the *human potential* window. More on this model in the spring semester when we have three weeks of applied psychology.

Today, we will *apply* this model to a quick review of math basics."

The news that we'd study some psychology momentarily captured my day-dreaming attention. My dad would enjoy hearing this. He kept telling me I had



to wait till I got to high school to study psychology and sociology. Ms. Mack's voice called me back.

"Two plus two equals four. Something we each know." She then distributed a plastic page to each of us. "Do not turn these over until instructed to do so." It sounded like a test instruction from ETS.<sup>1</sup> "Remember that window pane number two is information that *I know* but *you do not know*."

When I reveal this information, the contents of the page, to you, then we all know what it is. This process again is called feedback."

"How many problems of simple addition can you solve in sixty seconds? That is the question. Record your prediction in your journal. I do not know the answer. You do not know the answer. The future knows. Window pane number two is the 'education corner' because it is information that initially is *unknown* to you but will become known, and part of window pane number one which will grow bigger and bigger as the semester evolves. Scientists from the beginning of recorded history have journeyed into the unknown. They have turned over to us information to make our *beginning* quest both easier and more challenging." As she spoke, she gave each of us a felt marker. "Now, turn the 'paper' over but do not pick up the pen. Look at the page. There are one hundred addition problems on this page. Have you recorded a number in your journals?" As we did this, she paused.

"Very well. Ready? Pick up the felt pen. Get set. Problem solving! Go."

For one minute all was silent as we dashed off answers.

"Time's up. Pens away, please."

There were sighs and "oh no's" from the excited mathematicians—level one.

"Now, exchange papers and grade them." Ms. Mack was distributing keys to everyone. Count those correct. Put a check by each correct sum. You'll easily see how the key works. When you finish, return the paper. Make an *observation* about

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1. ETS—Educational Testing Service, Princeton, N. J.





the accuracy of your guess. This will be *known* information for the next time we play with ‘math check’ pages.”

“When will that be?” Michael asked.

Before Ms. Mack spoke, she raised her eyebrows and tilted her head as if to say “Guess?”

Cal did. “Not at this time, Michael, but someday we’ll get to that too.” His mimicking Ms. Mack was outstanding!

Ms. Mack laughed. So did we.

“Cal, you have found the secret of Rich Little’s success, among others.” Ms. Mack smiled, “He might have used his genius for observation in some scientific pursuit, but lucky for those who like to laugh, he has turned that eye, ear and attention to detail into a humorous profession. Remember the skills you learn in scientific studies are not isolated. They can be transferred to other areas. This will become *known* to you as the year unfolds. What’s next?”

“EASY” Judy said.

“The entire EASY is going to take more time than we have today,” Ms. Mack began.

“Since this is our third day of class, we shall begin with the ‘s’. Let’s hear what each of you chose for the ‘s’. Beginning with Joan. Fifteen seconds to relocate or recall your word, please.”

We sounded off.

Joan: “Scientific method.”

Michael: “Sensational.”

Ken: “Scientific method.”

Judy: “Serious.”

Robin: “Senses.”

Cal: “Structural study.”

Andy: “Study.”



Sherrie: "Search."

Kathy: "Sense."

"Excellent! All good words. Each one could logically be the word to fill in a 'Science is EASY acrostic.'" Ms. Mack nodded as she moved in front of her podium.

"To demonstrate which word I had in mind, please rearrange your chairs. Move them into a circle. I'll sit in this folding chair." Ms. Mack set up a chair at the back of the room. We followed creating a circle.

"Very good," she said as she distributed envelopes.

"We will now experience a dramatic reading."

"A dramatic reading?" several students repeated aloud.

"Yes. Each of you has a part to read. One or two of you may have a part that says 'Audience'."

Sherrie was about to turn over her envelope. Ms. Mack cautioned the class, "*Do not look.* We will save that curiosity until everyone has an envelope and I am safely in my chair to enjoy the process. As I was saying," she seemed to slow down as she moved within the circle placing the envelopes on the desks, "each of you will have a role to play. This dramatic reading is about a famous scientist who quintessentially defined the drive of the thinking person."

Immediately, three hands went into the air.

"Andy, you have a question."

"Yes, what is this quintessentially," he asked.

"Yes," Judy said.

"A new word?" Ms. Mack asked. "Anyone know?" With a round of shaking heads, Ms. Mack continued. "Very well, on a new page labeled vocabulary, please write q-u-i-n-t-e-s-s-e-n-t-i-a-l." Papers shuffled amid sighs. Ms. Mack pretended not to notice.



“In our quest for *facts*—nothing but the facts—you understand, we may, accidentally, discover new ways of expressing them. If we do not develop a working definition of quintessential today, a dictionary will help. Now, put all papers aside—all pens, pencils down and open your envelope. Please, quickly, scan the reading and put a star by your part.”

And we did.

“Note that three students also play an audience role. The audience’s role is very important. Enough said. Johannes is pronounced ‘Yo-han-es’. Let’s try that before we begin.”

And we did.

“There will be one minute of reading time for you to review your parts.”

“If you are ready, we will begin. We’ll discover together who has which part. Narrator?”

Judy was the narrator. She began with a story telling voice and we were off on a scientific adventure.

*Narrator/Judy (strong, confident voice):* Once upon a time, a youth began to learn in the country where he was born. His name was Johannes Kepler. This is what he heard when he went to church.

*Church (loudly):* The world is great. The world is great. The world is good. The world travels in a circle around the sun. Johannes Kepler! How does the Earth travel around the sun?

*Johannes/Michael:* In a circle, Sir.

*Church:* Very good.

*Narrator/Judy:* Johannes grew and grew and went to school.

*Teacher (emphatic voice):* There are many stars in the sky. There are planets among the stars. The planets travel in a circle



around the sun. Repeat after me, the planets all travel in circles around the Sun.

*Johannes/Michael:* The Earth travels in a circular path around the Sun.

*Teacher:* Very good.

*Narrator/Judy:* And next he went to the university.

*College Professor (learned wise voice):* The circle is the symbol of perfection. The church has taught this for centuries. The reason that the orbits of the planets are circular is that they are in perfect harmony in the sky. This is a circular orbit. Johannes Kepler, what is the shape of the pathway or orbit of the Earth around the Sun?

*Johannes/Michael:* A circle.

*College Professor:* A perfect circle, science is exact Johannes. Remember that.

*Narrator/Judy:* However, Johannes Kepler began to grow in his own observation skills.

*Johannes/Michael:* It seems to me that the Earth could not travel in a circular path. All my studies, all my observations indicate the Earth travels in a pathway that looks more like an ellipse than a circle. Maybe, I'll look again.

*Narrator/Judy:* And he did. Then, with the desire that most scientists have, Johannes wanted to share this new learning, this observation, with others. He went to church.

*Church (loudly, slow voice, ordering sound):* No, it is a circle.

*Narrator:* To his first teacher.

*Teacher:* No. It cannot be. It (slowly) is a circle.

*Narrator:* To his peers.



*Three students in unison:* Circle! (*Louder*) Circle! (*Louder!*)  
Circle!  
*Narrator:* Then to his professor.  
*College Professor (superior):* A perfect circle.  
*Narrator/Judy:* But Johannes sighed and said...  
*Johannes (whisper):* Ellipse.

We read the story through twice. It was the same. Silence at the end. Michael was Kepler and, *wow*, could he whisper.

Ms. Mack didn't say anything. Finally, Judy spoke. "Was it really like that? Was it really oppressive?"

"Haven't you ever heard of the Inquisition?" Ken asked. Judy shook her head. She really hadn't!

"Johannes Kepler was *skeptical*." Ms. Mack emphasized the word. "Another acrostic might give more details about others who lived with or around skeptical people. One even invented the bifocal lens, but you will read about that. Please, move your chairs back to lecture position."

While we did that, Ms. Mack distributed the following acrostic. It was easy to tell she liked this style of information delivery.

Franklin was one of our greatest scientists. His skeptical skills kept him active in many areas of study. He invented bifocals and playing cards. He studied the currents, temperatures between the colonies and England. He was a most curious human.

Adam's life was saved by one skeptical woman. In C. D. Bower's biography, there is a story of how a friend's wife refused to allow the practice of bleeding to be used on John Adams.



Kepler's entire work depended on his ability to step beyond conformity and into the skepticism zone.

Treadwell's handicap called nearsightedness was so severe that he had to look closely at everything he encountered. Somewhere he began to look closely at ideas too. He passed this knowledge on to John Adams, who benefited from independent thinking skills as he pursued a Nation's interests.

Skepticism is the "s" in EASY.

"That takes care about the 's' all right. What about the others?" Cal asked.

Ms. Mack nodded her head. "The clock on the wall reveals five minutes left. Time enough to distribute grading papers. Not enough time to continue the acrostic. You have before you several ideas on a method of delivering a seminar. Because you are in the video recorder generation, you will be tempted to put everything on film. As you read the grading papers tonight, be aware that your first presentation will be in person and three dimensional."

"In other words, no video tape," Ken grinned as he restated the obvious.

Cal persisted. "Will we work with Y-E-A tomorrow?"

"We will put Y-E-A on the unfinished business agenda. After we have a class discussion on grades and seminars, we will return to 'UB'. Is that satisfactory Cal?" Ms. Mack liked persistence.

"Thanks, Ms. Mack." Cal appeared content.

The bell rang. The class moved toward the door.

"Don't forget Kepler," Ms. Mack called after us.

"Who *could* forget?" Andy said in his most serious whisper.



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## Preparation, Frustration, Incubation, Illumination & Elaboration


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*There are just a few things a teacher can do, and  
that only for the sensitive and the spirited.*

IRWIN EDMAN

 **S**kepticism.” The word was forever on my mind. The night before the fourth class we had talked about it at dinner. My dad had suggested the word might be helpful while listening to the news or C-Span’s televised speeches. “A good word,” he had said. When I had told everyone about the E-A-Y left, it made for lively suggestions. The family was curious about what news I would have for that evening. So was I.

Everyone was by the door that fourth day—waiting. The bell sounded, the door opened and Ms. Mack greeted us with “Single file, please.” What now?! As we entered the room, she taped a card on each person. Specifically, she taped a card on each person’s back. As a result, we could each read the card on the back of another person but not our own.

“Please be seated,” she said. Curiosity won’t kill you *before* you write in your daily journal and make a guess or two about the upcoming activity. While you do that, I’ll take roll and begin to fill out some papers necessary for the funding of a project, Five minutes of writing time will suffice.”



That was it. This pattern was becoming familiar. Journal writing. Again, we could include anything at all, It could be personal, editorial or sometimes related specifically to a “guess” about the day’s lesson. Ms. Mack seemed to think that guessing could be taught.

“Guesses are questions in disguise. They lead to hypothesis testing.” She had spoken slowly, deliberately with the expectation that this notion would be “imprinted in the electrons and gray cells that danced behind our eye sockets.” She may have been right, for to this day, when I see some curious activity, behavior, or situation, I wonder why and proceed to formulate guesses.

*Journal*

31, August 1989

Today, we were greeted at the door by Ms. Mack. She taped cards on our backs—one per person. I saw a few: beaver, bear, rabbit and Woody Allen. Now, we have to formulate a “guess” about this activity. I do not know what is on my back. We were cautioned by the overhead to “withhold discussion about cards and information on the cards until directions were given.”

Some people are turning around so others can see. No one gives details. All they do is nod. Sometimes they grin. As for a “guess,” maybe we’ll look at the person’s card and play a type of charades where the “Knower” acts out the word on the card and the “Unknower” has to guess. Or maybe we will ask questions. They all look like animals except for Woody, so I doubt that it is a task on categorizing animals by footedness—as in two, four, etc.





Mahler's Ninth stopped. Time was up. We had adapted to that norm already.

"Journals away, please. Today we are going to with questions. In your notes under the date, please identify words that a journalist would use to gather information. One minute writing time."

One minute. Always one minute. This working against the clock was new for me. New except on achievement tests. "Where, when, what, who" came quickly. Glancing around, I saw that others were still thinking about this. I knew I had missed something. Surely, there were more words but my mind was a blank. Why? I wondered. "Why!" There was another one.

"Time's up. Please turn to your neighbors and check your list with theirs. If you find more words, add them to your list."

"How and which" popped up as I talked with Andy.

"What do you think this card on the back is all about?"

"I don't know," I said with a shrug, "but we'll soon find out. Look."

"Name tag" was on the overhead. Ms. Mack raised her hand, a sign that she needed quiet for us to continue.

"Good. Now that you have some words to work with, here are the instructions for this curiosity game. Each of you has a name of an animal on your back. You will get out of your chairs and go to each member of the group to ask a question. The questioning period is five minutes. Here are the guidelines:

1. You may ask any question as long as it can be answered *yes* or *no*—in *Japanese*. *Hai* is *yes*, *Iie* is *no*. You may write that down on a clean sheet of paper to take with you as you gather data.

2. One question per person. You may go back to a person after you have asked each of your peers a question.

3. Absolutely no hints allowed. No facial expressions that give clues about "warm or cold" either. The goal is for each person to exercise their questioning muscles today.



4. Record what you learn about your animal. The information to be used in your process paper at the end of the game.

5. You will have five minutes. At the end of the five minutes you will each write a paragraph on what you think your animal is and *why*. Give as many details as possible in the three minutes writing time allowed. Do not remove your name tag until I ask you to do so. This is important.

Any questions?"

"Yes." Ken was seeking clarity. "Would you pronounce those yes and no words again, please?"

"Certainly. *Hai* (Hi) is yes. *Iie* (e-eh) is no. Altogether now. *Hai*."

"*Hai, hai, hai*," we repeated.

"And *iie*."

"*Tie, iie, iie*." I was already thinking about what my kid brother would do with this information.

"Ready. Set. Questions." Ms. Mack grinned broadly. She seemed to enjoy this.

(It makes it easier to tell you that I had "Clydesdale horse" on my name tag.)

"Do I have four feet?" I asked Andy.

"*Hai*," he replied. "Do I have a tail?" He was wearing "chimpanzee."

"*Tie*," I said.

Ken waved to me. "Do I live in a jungle?"

"Let me look." He was wearing Woody Allen. "*Hai* and *iie*." I said with a shrug. After all some people think New York City is a jungle.

I moved on. "Am I shorter than knee high?"

"*Tie*." Ken seemed pleased with his response.

Sherrie came over. She turned around to reveal "elephant." "Do I like water?"

"*Hai!*" I told her. This was fun!

Robin tapped me on the shoulder. "Do I make a loud sound?"



"Iie," I replied as I had not heard of rabbits making a lot of noise. "Do I have hair or fur?"

"Iie," came her reply.

By now people were pausing to make notes on what their animal did or did not have. I noted questions on environment, size, feet or wings that had been asked so far. I looked for Ken. By now, he was thoroughly confused. People seemed to answer his question seriously but had a tendency to grin when they walked away. Even Ms. Mack was amused by what she saw. "Hai" and "iie" were heard everywhere.

My next plan was to try sounds. Trial and error created my questions until I whinnied for Michael. "Hai" he nodded with the biggest grin I had seen in a sea of smiles that day. Smugly, I continued to answer questions until time was called.

"Time's up! Be seated, please. Three minutes for brief paragraph writing."



### *Journal*



I am a horse. I whinny, have four legs, am taller than myself. I have fur and am a mammal. I went on to give some process details about trying different styles of questions until I happened upon the sounds device. That's when I found that I was a horse.

Brief and concise! I was proud of that. Others were still writing. Ken looked befuddled.

"Thirty seconds. Time to wrap it up." Ms. Mack was wearing her stopwatch like a necklace.

"Good. A few notes *before* we check the name tags."

Groans met that news. Undaunted, Ms. Mack turned to the transparency that announced her lecture. "Back to the notebook!" *Stages In The Creative Problem*





*Solving Process* (Krutchfield). Hopefully, several of you will recognize the feelings inherent in these stages as you progress through them, taking notes, of course.

Number one is *preparation*. This is the stage where you have a question—something to ponder.

Number two is *frustration*. Maybe you couldn't figure this out so easily. Some of the animals may have been more elusive than others. Initially you had the awkward task of using words from another language. You couldn't converse freely. A feeling perhaps of 'This is dumb!'. All symptoms of the frustration stage—a necessary part of the creative problem solving process.

Number three is the *incubation* stage. You take your notes, go from one person to another, ask questions and think. Maybe you give up for a while. You let your mind rest. For some scientists, this stage functions best while they are asleep. This stage leads to number four.

Number four is *illumination*. This is the 'Aha! I've got it!' stage where you either figure it out or come upon a plan to find your answer."

"Hai" was heard from Michael. Nods and laughter followed.

"Hai, indeed." Ms. Mack agreed. "And the fifth stage is *elaboration*, in this case the brief paragraph you wrote."

Ms. Mack paused as we wrote each of these in our class notes. Memorize these, please. They will be with you for a long, long time. You may now remove your cards from your backs. Check your answers."

Almost immediately, Ken cried, "Oh, no!"

"Something wrong, Ken?" Ms. Mack struggled to maintain a straight face.

"This is a trick. You said animal," Ken said emphatically.

"A human being is an animal, however remarkable." Ms. Mack looked at Ken and then at me as she asked. "Did you assume that animal meant one tamed or domestic? A generic category of animal, perhaps?"

"Yes," he replied. I knew I was next.



“Joan, did you guess correctly?”

“No, ma’am.”

“What was on your card?”

“Clydesdale horse.”

“And what was your guess?”

“Horse.”

“What happened? Was an assumption involved?”

“Yes. I admit it. This is embarrassing,” I began accepting responsibility for my error.

“Don’t be. You could not have known there were two so called ‘trick’ name tags designed to get you to think—unless you had a game like this before. I was assuming you hadn’t. Tell us what you’re thinking was.”

“Okay, first I had read all the cards. Each was an animal except for Woody Allen. You’re right. I never thought there might be another ‘tricky’ one. I did assume mine was just a horse after I got a ‘hai’ for the whinny sound. And I haven’t played a game like this before.”

“Very good, Joan. Can you think of a question that might have helped you if you hadn’t stopped asking questions after you got a ‘hai’ on the horse’s sound?”

“Yes. Am I a particular breed of horse?”

“Excellent. Scientists have to check out many questions and then check out more questions *beyond* the ones they have answered. *skepticism* is very important. This is a beginning for questions and creativity. More work will come later, but for now we are going to switch gears and look at another process for in-depth problem solving. It is called *brainstorming*.”

“The topic is school pride or greater school involvement,” Ms. Mack said as she wrote on the overhead. Whatever you think might *increase* student participation will be appropriate.” She paused.

“How much time do we have?” Andy asked. “My brain has to warm up.”



“This is warm-up, Andy. Three minutes. Begin.”

The only sound in the room was the smooth sound of pens in motion. Fun city! No wrong answers!

“Time!”

“Next, you will join with two people you haven’t worked with before. Take a minute to be sure you know who is in the group, then choose a recorder. The major qualification for the recorder is legible writing or printing.”

We rearranged our chairs. I joined Ken and Robin. Robin had the best penmanship. She gladly accepted.

Ms. Mack gave each group a huge sheet of beige newsprint.

“Record all ideas on this paper. If an idea is a repeat, one statement will suffice. What we want in the next five minutes is a list of ideas already generated in your group.”

“Five minutes,” she said, as she winked in Andy’s direction.

It took every bit of five minutes to transfer our ideas. We wanted to discuss each one, but Ken kept us on task. For a moment, I noticed the noise level in the room, but selective attention worked as I further noticed no one paid any attention to any other group’s activity.

Mahler’s Ninth interrupted us.

“Time!” echoed throughout the room. Each recorder taped the newsprint on the wall at the far end of the room.

Ms. Mack paced in front of the “data.” We stood there reading each group’s ideas, chattering to each other about “good idea,” “we had that!” etc.

Ms. Mack nodded and raised her hand. Her signal for quiet worked.

“Very well. Lots of ideas here. This data will remain here till Tuesday, next Tuesday. Your assignment is to ask at least five other people including one person over twenty-one years of age what they think would improve student involve-



ment in the schools. Bring this data to class on Tuesday. We will proceed from there.”

“To do what?” Patty quickly asked.

Ms. Mack grinned, put her huge glasses on her nose, and said, “*Inspect*, of course.”

The bell rang.

She called to us as we left that the next day would be a “surprise.” As if the unexpected were anything new.

That night it was my brother who asked “What did you do in that strange class today?”

“Unique,” I said, “unique.” My family seemed to enjoy listening to the rules of the name game and the brainstorming.

Mom said, “Well, all I know is that *I* want to put an idea on your list.”

“Good!” I said enthusiastically.

“There’s one thing about this class, Joan, you need to consider.” My dad spoke soberly, thus quieting the energy at the table. “If it continues like this, you won’t need to diet, ‘cause you haven’t had a chance to eat!” He laughed out loud as I looked at my full plate.







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## Epilog

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*I get quiet joy from the observation of anyone  
who does a job well.*

WILLIAM C. FEATHER

After these last four days, I had wondered what might happen on Friday that could possibly be different. We had already internalized the norm, “expect the unexpected.”

As usual people were waiting on the steps of the classroom when I arrived. The hubbub centered around “what’s up for today?” Hypothesis testing was a term now embedded in our vocabulary—for class and other teen interests.

The suspense was soon over as the door opened. We filed in to find the desks arranged in straight rows. What now.

Mahler’s Ninth played. We spent the allotted time writing in our journals. Mine included a “guess” that the music would change the next week. Maybe something by Bach as his vibrations were out there rushing through space?

“Time!” The music stopped. Ms. Mack was dressed in her “Sunday best.” High heels and all. Definitely something to put in the observations section of my daily journal. Wonder why? Maybe she was going to court or some place special after school?

“Class,” she began, “today we have special visitors. Four individuals will speak to us about their scientific interests. These guests have been given time off from



their studies in the high school to be here today. This is part of the social interest or social service aspect of science. These presentations were selected, not necessarily for the intense scholarship involved in their development, but for their diversity. Without further discussion, may I introduce Eric, Amber, Stephanie and Yoake.”

The four students walked into the room. One of them we recognized because she had been in our school the year before. The others were older. It turned out that each person was in a different class (freshman, sophomore, junior and senior), They, too, were dressed in formal clothes.

“Eric is a senior in the high school. He studied science in this room three years ago. Eric is interested in music, math and Hawaii, and plans a career in teaching. Eric will be speaking to you today on Science as Entertainment. Please welcome Eric.”

And welcome him we did. Eric was also gifted in magic tricks, which he used to keep our attention fine tuned. Basically, he had taken a “kid’s book” on science experiments and turned it into show and tell. It was a seven minute presentation that had our class cheering before it ended. In the questioning time, we found that Eric did not do this presentation when he was in the eighth grade. He developed it for a high school class in Human Development taught by a friend of Ms. Mack’s who expected the students to engage in field studies or developing teaching plans. The news that the high school also had a class as weird as this one raised a few eyebrows, including mine. Eric willingly supplied information on where to find this book and several others with experiments as he ended his presentation by distributing a bibliography.

“No time to waste today,” Ms. Mack asserted as Eric sat down to watch the next presentation. “Our next guest is Amber. Amber is a junior in the high school. She is interested in sports, cooking, English literature and history. Pres-



ently, she is planning to study accounting. Amber's presentation is titled 'Numbers, Numbers and More Numbers'. Please welcome Amber."

Amber acknowledged that the title may have created a prejudice. After a few nods, she began. Ms. Mack forgot to mention that Amber was using a slide presentation to make her points. First, she switched in the voice of a sports announcer and started spouting statistics. Before anyone realized this was a lecture, she demonstrated how the mean, median and mode were calculated. News flashes on I.Q. scores, achievement scores and percentiles were next. She made them sound easy. Her math occupation section featured a professional tape reader for the New York Stock Exchange. She quickly gave us the information to make the ticker tape make sense. Wow! Would my family be impressed with this information. She ended the whole thing by giving a demonstration of enjoyable numbers on a Casio player for all the uninitiated in piano lessons. She, too, had not developed this brief but interesting talk in the 8th grade. She had been allowed to take college math classes and was "simply" applying some of the lessons learned there. Amber distributed a bibliography that included math careers (salaries too!) and math puzzles.

"Moving right along." Ms. Mack was back in the front of the room to introduce the next speaker. "Stephanie is a member of the high school student council. She is part of a group that sponsors the science student exchange each year. We will not have time to hear about this today, but perhaps we can persuade her to return to give us details. A junior high could have one of these too. Stephanie is president of the drama club and has other interests in the Audubon Society and the ski club. Presently, she is studying Spanish and hopes to get a job one day as a journalist. Please welcome Stephanie."

If we had taken time to think about it, we might have come up with the guess that Stephanie would do something about birds. She didn't. The presentation



began with her singing a few lines of “Nobody Knows The Trouble I’ve Seen” followed by a brief monologue titled “So Misunderstood.” This turned out to be the title of her presentation on “harmless, beneficial snakes!” She had a series of watercolors on these and very strong arguments on behalf of each. During the questioning period, we discovered that the paintings were hers, but that the idea was a project she had developed for her ninth grade general science class. Again, she had a bibliography that consisted of the names of the snakes and the book that had primarily served as her resource for anecdotes.

“Our last speaker today may be someone you all know. Yoake was in the Out-of-The-Ordinary Science Class last year. This year as a freshman in the high school, she has expressed interest in the chess club, the swim team and the Current Events discussion group. Yoake says she is still ‘shopping around’ for areas of interest, but you will soon see she has found one—chemistry, Yoake’s presentation is entitled ‘Safe, Sane and So Secure.’”

Where did these people get these titles? We were to learn that Yoake did give this presentation last year in the spring term.

Yoake came to the front of the room carrying a huge suitcase. Inside were common, ordinary things that people might have around the house. Yoake stressed the importance of safety in the use of these products and their storage. The stories she told about human pain and suffering were enough to make me want to go home to do a safety and storage check. The bibliography included national phone numbers for the Poison Center and Consumer Beware, a group that had a computer full of information of product safety.

That was it. Almost time for class to be dismissed for the day. We thanked the speakers with applause. Ms. Mack uttered the no additional homework phrase that was music to many ears. We adjourned to talk with the guests for the rest of the class.



The first five days were over. They were the beginning of a pace and a range that would make that year a “very interesting” 180 days. So interesting in fact that I still have my notebook from that time.

Ms. Mack retired a few years ago. Retired may not be the right word. She and her husband travel often. When she is at home, she sometimes gives workshops and volunteers in the local elementary school. No telling what fifth and sixth graders think of the woman in the dashiki who likes to talk about the out-of-the-ordinary science. What I thought of her is obvious.

