3.8 Hiring a Scientist—— Written Assessment

Action Synopsis

Students recommend who GROW should hire as a scientist after reviewing three job applications.

One Session		**1 hour**
1. Write a description of an ideal scientist, and share ideas with group members.		*examining prior ideas*
2. Read a challenge that requires ranking three candidates applying for a research position with GROW.		*posing a challenge*
3. Work in groups to review job applications, determine pros and cons of each candidate, and rank them.		*applying knowledge*
4. Have a final discussion about the choices, and reflect on scientists as people.		*reflecting*

Desired Outcomes

By the end of this assessment activity, students should:

✓ Understand that being a good scientist requires a range of skills and qualities.

✓ Be able to identify the weaknesses in an experimental design.

✓ Know that collaboration is an important aspect of science.

✓ Be able to modify opinions based on convincing arguments.

What You'll Need

For each group of 3–4 students:

- ❑ copy of three "Job Applications" (pages 352–354)
- ❑ copy of "Scoring Sheet" (page 351)

For each student:

- ❑ copy of "Challenge Sheet" (page 350)
- ❑ copy of "Scoring Sheet" (page 351)

Getting Ready

♦ Decide on groups of 3–4 students.

Action Narrative

By doing research for GROW you've learned what it takes to be a good scientist. Now you'll have a chance to help GROW choose a scientist to hire. First, take a few minutes to write a description of an ideal scientist—someone you would like to have working for you or with whom you would like to work.

Have students develop their own descriptions independently. They can write descriptive narratives or lists of attributes. If they are having trouble getting started, have them think about the scientific standards they upheld while doing activities such as designing experiments, giving and receiving peer reviews, setting up and maintaining fair tests, keeping records, interpreting results, and collaborating.

Get together with your group and share your descriptions.

Assign students to groups. Encourage them to discuss how their lists differ, and to explain to one another why they think certain characteristics are or are not important for being a good scientist.

Now that you've thought about what you'd look for in a scientist, here is your challenge.

Hand out and go over the "Challenge Sheet."

What should I look for when I score your work?

After students share their ideas for scoring criteria, hand out and go over the "Scoring Sheet" to use or adapt according to their suggestions.

Here are applications from three job candidates. When you've completed the "Challenge Sheet" we'll make a final decision as a class about who GROW should hire.

You might need to explain the initials PhD, MS, and BS to students. They can look up unfamiliar words, such as *anthropology*, *zoology*, and *botany*.

Some groups might choose to have each person fill out pros and cons for a different candidate, then present his or her ideas to the group for additional input. Others might prefer to have someone read each "Job Application" to the group and generate pros and cons together. In either case, students should assign a recorder to make a copy of their work to hand in. Suggest that each person sign his or her name on the completed "Challenge Sheet" to indicate that they've read and approved it.

While the students work, make a class chart for recording their decisions.

Let's see how each group rated the candidates.

Record the number of 1st, 2nd, and 3rd ratings each candidate received.

	1st	2nd	3rd
Roberto Zack	1	0	6
Cicely Monroe	2	5	0
Leah Kleinman	4	2	1

What were some of the pros and cons that influenced your decisions?

Have students discuss the strengths and weaknesses of the three candidates' experimenting skills, as well as other factors they considered to be important, such as personality, ability to collaborate, academic background, and relevant experience. See pages 348–349 for pros and cons students might mention.

Now that you've heard each group's reasons for their choices, can we agree on one candidate to recommend to GROW?

Challenge students to come to a consensus rather than saying that the candidate with the most 1st choice votes "wins." If some groups won't change their minds, then the class might decide it would be best just to report its different opinions to GROW.

Conclude with questions such as:

Did your images of an ideal scientist take into account that scientists have human strengths and weaknesses just like anyone else?

Help students see the importance of having high standards for science, while at the same time realizing it is not just a field for an elite group of people.

Can you imagine a lot of kinds of people being scientists?

Students should realize that anyone with an interest in science, and a willingness to work hard, can be a scientist. Also, different scientists have different styles and approaches to their work, all of which can be successful. Meeting scientists in their own community, as well as reading about scientists, would help to enrich students' images of scientists.

What sort of training would you give a scientist you hired?

Students' responses will reveal whether they think that scientists' collaborative skills and habits of mind are as important as technical skills and knowledge.

What advice would you give to the two people you didn't choose, to help them get jobs in the future?

Students should realize that people can develop and strengthen their scientific abilities.

Hand in your individual descriptions of an ideal scientist, as well as your group's "Challenge Sheet."

Before students hand in their scientist descriptions they could add new perspectives they gained as a result of the class discussion. See below for information on evaluating their work.

Ongoing Assessment

Student Reflections

Have students fill out a "Scoring Sheet" for their group's work.

Teacher Reflections

When reading students' descriptions of an ideal scientist, look for indicators that their own experiences doing science have enriched their perspectives beyond stereotypes. Typically students' descriptions include a combination of the following attributes:

Has a good education, knowledge, experience

Can help society by creating cures or inventions

Is interested in and enjoys science

Willing to work hard

Not afraid to do new things, reaches for the unknown and unexpected, is curious, asks a lot of questions

Can stick with something, can handle frustration and disappointment, is patient

Is accurate

Has a sense of humor, pride, imagination, creativity

Cares about the world, the environment, and other people

Is reliable, independent, organized, responsible, has common sense

Has skills with computers, microscopes, chemicals

Has experimenting skills like observing, making a fair test, keeping records, drawing graphs

Is logical, has good study habits, can solve problems

Is cooperative, works well with others, shares ideas, can give and take constructive criticism

There is no one right answer to the challenge of ranking job candidates. The chart below shows some of the pros and cons to look for in students' lists.

	Pros	Cons
Roberto Zack	• he models nutrient cycling on computer so must understand and be interested in it • he did a study testing dead plants as fertilizer • he's creative and can come up with new ideas • he's good at math, so will be good at analyzing data • he can use high-tech equipment like an electronic nutrient analyzer	• his experiment didn't have any replicates, yet he drew a conclusion anyway • he didn't measure the nutrients in the soil before he started growing grass to make sure they all started the same • he might draw the company down if he needs a lot of support when he gets discouraged • he might be too impatient to stick with experiments long enough, or he'll try to rush things to get results
Cicely Monroe	• she has degrees in ecology • she has studied how dead plants fertilize soil • she tested 25 of each kind of plot, so had a lot of replicates • she took a lot of samples • her experiment lasted for 3 years, so she's willing to take a long time to do things right	• she doesn't like to work with other people • she's not willing to share ideas, so she might not tell GROW what she discovers, and her work might not be as good if she doesn't ask for feedback from other people • she might spend more time and take more samples than is necessary to get reliable results

	Pros	Cons
Cicely Monroe (continued)	• she based her conclusions on solid evidence • she is precise and willing to stick with things even if they're boring • she knows a lot about plants	
Leah Kleinman	• she has worked for an industry that probably made things like fertilizer • she's curious about plants and has a degree in botany • she asks interesting questions • she has experience testing the effects of fertilizers on plants • she would be a good employee because she pitches in and works hard	• her experiment wasn't a fair test because she planted the corn in two very different kinds of places • she drew conclusions without considering that it might have been the soil near the riverbank, not the fertilizer, that made the plants produce more ears of corn • other scientists don't think her work is good, so GROW's scientific work would have less credibility

How students weigh the pros and cons to rank the candidates will depend on their opinions about the most important qualities of a scientist. For instance, many students choose Leah Kleinman as someone with whom they would prefer to work. Even though they realize that her experimenting skills are weak, they reason that skills can be taught, whereas the personality characteristics of the other candidates could make them difficult to work with and would be harder to change. This is a testament to students' own experience doing research in collaborative teams, and in fact reflects the importance of collaboration in professional science. Their supporting arguments for their 1st choice candidate should reveal that they've taken that candidate's shortcomings and strengths into consideration.

NAME(S)_____ DATE_____

HIRING A SCIENTIST

GROW wants to hire some scientists to help develop natural fertilizer products. They are ready to hire one person now, and will hire more later.

YOUR CHALLENGE:

1. Read the Job Applications and write down the pros and cons of each applicant.
2. Rank the candidates as your 1st, 2nd, or 3rd choice to help GROW decide who to hire.

	PROS	CONS	RANK
Roberto Zack			
Cicely Monroe			
Leah Kleinman			

3. Make a case for your 1st choice by explaining why GROW should hire that person. Use the back of the sheet.

NAME(S)_____ DATE_____

HIRING A SCIENTIST

OBJECTIVES	POINTS				SCORE
	3 High Quality	**2** Meets Objectives	**1** Falls Short	**0** Not Done	
CONTENT					
1. Pros explain the strengths of candidates.	_____	_____	_____	_____	___ x 2 =___
2. Cons explain the weaknesses of candidates.	_____	_____	_____	_____	=___
3. Ranking of choices shows that pros and cons were weighed.	_____	_____	_____	_____	=___
COMMUNICATION					
4. Case for 1st choice has good supporting reasons.	_____	_____	_____	_____	=___

COMMENTS:

FINAL SCORE: _____

Total Possible Score: 15

Overall Achievement:

13–15 High
10–12 Sound
5–9 Limited
0–4 Inadequate

JOB APPLICATION

NAME: Dr. Roberto Zack

EDUCATION:

PhD and MS in Zoology, East Central University
BS in Computer Science, Wexon College

MOST RECENT JOB:

Research Scientist at East Central University making computer models of nutrient cycling

SUMMARY OF MOST RECENT EXPERIMENT:

I wanted to figure out if leaving cut grass to decompose on lawns would add extra nutrients to the soil. I made three huge boxes in a greenhouse. I added soil and grass seed to each one. After the grass grew in each box, I mowed it. In the first box, I removed the cut grass. In the second box, I left the cut grass on top of the soil. In the third box, I left the dead grass, and also added extra decomposers, like earthworms, fungi, and bacteria, to the soil. After one month I tested the soil in each box using an electronic nutrient analyzer. I found that the soil in the box with extra decomposers in it had the most nutrients. The soil in the box that had no dead grass in it had the fewest nutrients. I concluded that if people want healthy lawns they should not remove the cut grass after mowing, and they should also add extra decomposers to their soil.

HOBBIES:

Gourmet cooking, skiing

COMMENTS BY PEOPLE WHO GAVE REFERENCES FOR THE CANDIDATE:

"Roberto is very creative when designing experiments. He has a talent for thinking of amazing techniques that have never been used before."

"When things aren't going well, Roberto can get really sour. He likes things to happen quickly, so doesn't have much patience with long experiments. He gets so frustrated sometimes that he needs a lot of supportive people around to encourage him to keep trying."

"Roberto is is a whiz with math and computers. He is very familiar with using high-tech equipment."

JOB APPLICATION

NAME: Dr. Cicely Monroe

EDUCATION:

PhD and MS in Ecology, Radmore State College

CURRENT JOB:

Land Manager in Bixton State Park

SUMMARY OF MOST RECENT EXPERIMENT:

I tested the soils in areas of Bixton State Park where trees were being cut for lumber. In some of the areas the work crew chipped all of the leftover branches, then transported the wood chips away. In places where the workers couldn't bring in a wood chipper, they left the wood to rot on the ground.

I wanted to see how many nutrients were in the soil in the two kinds of places. I tested 50 different areas, 25 where wood chips were taken away, and 25 where wood was left to rot. I took thousands of soil samples for three years. After I did chemical tests on the samples, I found that in areas where all the wood was taken away, the soil didn't have many nutrients. Where dead wood was left on the ground, the soil had more nutrients. I concluded that when dead branches rot they return nutrients to the soil, helping new trees to grow. I recommended that branches should be left on the ground in all logged areas of the park.

HOBBIES:

Whitewater canoeing, organic gardening

COMMENTS BY PEOPLE WHO GAVE REFERENCES FOR THE CANDIDATE:

"Although many people would find taking thousands of soil samples boring, Cicely never lets it get to her. She is always very precise when taking and analyzing her samples."

"Cicely would rather spend her time alone in the woods or in the laboratory. She is not what I'd call a sociable person. She is hesitant to share her ideas with others."

"She must know more about the plants and animals in this state than anyone else alive! She even knows the names of the different kinds of mosses—they all look alike to most people."

Job Application

Name: Dr. Leah Kleinman

Education:

PhD and MS in Botany, University of Windsor

Current job:

Research Associate at TecPro Industries studying the effect of fertilizers on crop plants

Summary of most recent experiment:

I designed an experiment to find out whether a certain fertilizer would increase the number of ears of corn a crop would produce. I planted corn in a 2-acre field near a riverbank, and gave this field the fertilizer. Then I planted the same kind of corn in another 2-acre field on the outskirts of town, and did not fertilize this field. At the end of the growing season I harvested the corn from both fields. I found that the fertilized field produced more ears of corn. I concluded that the fertilizer I tested makes corn plants produce more ears of corn.

Hobbies:

Cave exploration, playing the flute, square dancing

Comments by people who gave references for the candidate:

"Leah is a real team player. She'll pitch in on a project, do more than her share, and encourage everyone else to do his or her best."

"Many of Leah's papers are turned down for publication by the scientists that review them."

"Leah has always been very curious about plants. She thinks of interesting questions, and is willing to do research to try to find answers."