Irrigation Ideas

Student Worksheet: Ethical Implications

Irrigation can route water to fields, help crops overcome drought, provide drinking water, and support waste removal.

But, how do engineers and others decide which use of water is the most important? What are the ethical considerations that must be reviewed to strike a balance of fairness?

For example, what if one farmer routed a river to serve his or her own crops and in doing so prevented his neighbors from receiving any river water?

Or, if water was routed to a company that stood to make a great deal of money from a profitable manufacturing facility, but in order to provide enough water for their process, all water would be diverted from small local farms farmers who might lose their livelihood. What would be fair?

Engineers are continually faced with ethical considerations when building structures, designing systems, and improving products.

Engineering does not have a single standard for ethical conduct because approaches vary somewhat by discipline. For example, a biomedical engineer might be concerned with respecting the feelings of a patient, or would want to pay particular attention to the reliability of a product such as an artificial heart. A civil engineer would consider safety and strive to develop a bridge that is not only safe, but also cost effective. A bridge could be over constructed, be safer than it would ever need to be, and be over budget as well.

Question:

1. Can you think of an example of how a team of engineers might have to address ethical considerations related to the environment when building an irrigation system? What do you think the team would have to investigate before starting construction?

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Student Worksheet:
Design Your Own Irrigation System

You are part of a team of engineers who have been given the challenge of developing an irrigation system that will carry two cups of water a distance of three feet and split the water into two separate destination containers. If your system works, you'll end up with exactly one cup of water in each of your destination containers. How you accomplish the task is up to your team!

Planning Stage
Meet as a team and discuss the problem you need to solve. Then develop and agree on a design for your irrigation system. You have been provided with many items you may use to construct your system. As a team, come up with a plan, and draw your design in the box below. Be sure to indicate the materials you anticipate using. Present your design to the class. You may choose to revise your teams' plan after you receive feedback from class.

Materials Required:

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Student Worksheet (continued):

Construction Phase

Build your irrigation system. During construction you may decide you need additional items or that your design needs to change. This is ok -- just make a new sketch and revise your materials list. You may want to trade items with other teams, or request additional materials from your teacher.

Testing Phase

Each team will test their irrigation system to see how it functions. You'll have three chances to test your system. At the end of each test, you will measure the amount of water in each of the destination containers. Remember, your goal is to end up with one cup of water in each. Your best attempt will be the one that counts. Be sure to watch the tests of the other teams and observe how their different designs worked.

Evaluation Phase

Evaluate your teams' results, complete the evaluation worksheet, and present your findings to the class.

Use this worksheet to evaluate your team's results:

1. Did you succeed in creating an irrigation system to split the two cups of water into two separate destination containers? What was your best result?

2. If your system failed, what do you think went wrong?

3. What was unique about either the design or construction of the irrigation system that had the best results on this challenge in your classroom?

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Student Worksheet (continued):

4. Did you decide to revise your original design while in the construction phase? Why? How?

5. Do you think that engineers have to adapt their original plans during the construction of systems or products? Why might they?

6. If you had to do it all over again, how would your planned design change? Why?

7. How do you think your design would have had to change if the material you were distributing was honey?

8. Do you think you would have been able to complete this project easier if you were working alone? Explain…