

# Under the Weather

*Keeping the Midway Cool*

**GAMERS**

**QUEST 10**  
ENVIRONMENTAL  
SCIENCE

**STATE FAIR OF TEXAS**  
**CURRICULUM**

The State Fair of Texas may take place in the early fall, but in Texas that can still mean soaring temperatures. Explore the different methods the Fair employs to keep fairgoers cool, and determine how efficient these methods are.



### During this Gamer Quest, you will:

- ★ Use tools of meteorology in various areas of the Fair and record findings
- ★ Use acquired knowledge of abiotic factors to make suggestions to the Fair for future years.



### Learning Standards

- ★ Environmental science TEKS: 2F, 2G, 3D, 4D, 6C
- ★ Art TEKS: Art I: 1A, 2A, 3C
- ★ ELAR TEKS: E4(1)(A), E4(15)(B)(i), E4(15)(B)(iv), E4(15)(B)(v)



Source: <https://getmomreadyforthewedding.files.wordpress.com/2012/03/sweating.jpg>

### Before You Go

- ★ Introduce the following terms: biotic factor and abiotic factor.
- ★ Define abiotic factors such as sunlight, temperature, and humidity.
- ★ Discuss how changes in abiotic factors can change an ecosystem. Ask students for their examples of how changes in ABIOTIC factors can change the flora and fauna (BIOTIC factors) in an ecosystem
- ★ Create sling psychrometers in class:
  - Attach two cheap plastic student thermometers back to back with tape.
  - Thread a string or some yarn through the now connected holes at the top.
  - Place something that can be moistened over the entire bulb on one thermometer.
- ★ Go outside and teach students how to use and read the sling psychrometer. Record the data they find.

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## STATE FAIR MAP



### Invitation

- ★ Invite students to bring the listed materials and follow the route, and perform the tasks below at the State Fair of Texas:

### Plan Your Route

- ★ Make your way to the center of the Fairgrounds
- ★ Explore the Midway as you follow the “While You’re There” instructions on the right!



### Optional Materials to Bring

- ★ Writing utensil and something to write on
- OR
- ★ A way to digitally take notes
- ★ Sling psychrometer made in class



### While You’re There

The objective of your visit is to collect abiotic factor and biotic factor data on the Midway and Midway area.

- ★ **SLINGING UP SOME DATA:** Use your sling psychrometer to collect data to use in class.
  - Record the time you are collecting data.
  - Find an area of the Midway where the abiotic factors have been altered by Fair staff (shade netting, sails, fans, etc.)
    - CAREFULLY use your sling psychrometer for one minute and record your wet side and dry side in Celsius.
    - Record some observations about the people in that area. How many are there? Do they seem lively, tired, hot, etc.?
  - Find an area of the Midway with a large tree.
    - CAREFULLY use your sling psychrometer for one minute and record your wet side and dry side in Celsius.
    - Record some observations about the people in that area. How many are there? Do they seem lively, tired, hot, etc.?
  - Find an area in the Midway or slightly outside of it in full sun.
    - Record the cloud cover and cloud type (if any)
    - CAREFULLY use your sling psychrometer for one minute and record your wet side and dry side in Celsius.
    - Record some observations about the people in that area. How many are there? Do they seem lively, tired, hot, etc.?

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o A **"COOLER" DESIGN (ART PORTION):** As you're observing, consider:

- Does the Fair map have a list of places to rest and get cool?
- In the art portion of your project, you'll get a chance to design something! Think about how you might tackle this...



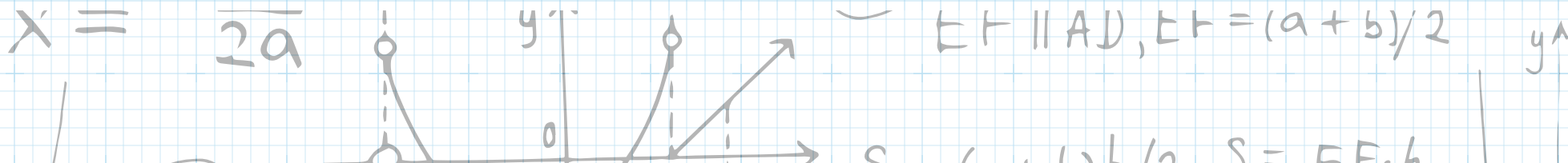
## After the Fair

When you return to class following your State Fair visit, you will formulate a plan for officials at the State Fair:

- ★ Your teacher will provide you with a relative humidity chart.
  - o Use your recordings of your wet temperature and dry temperature to determine the relative humidity in the three zones.
  - o Record your relative humidity and temperature (in Celsius) for the three zones on a chart.
- ★ Partner up with three other students.
  - o Compare your data and see if there are any large variances.
  - o If there are, come up with hypothesis to explain these large variances.
  - o Describe the differences in how biotic factors (in this case humans) reacted to the differences in abiotic factors.
- ★ Formulate your plan!
  - o Identify your findings and make suggestions for alterations to the Fair that will bring more fairgoers or make their current fairgoers happier.

Relative Humidity (%)

Dry-Bulb Temperature (°C)	Difference Between Wet-Bulb and Dry-Bulb Temperatures (°C)															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
-20	100	28														
-18	100	40														
-16	100	48														
-14	100	55	11													
-12	100	61	23													
-10	100	66	33													
-8	100	71	41	13												
-6	100	73	48	20												
-4	100	77	54	32	11											
-2	100	79	58	37	20	1										
0	100	81	63	45	28	11										
2	100	83	67	51	36	20	6									
4	100	85	70	56	42	27	14									
6	100	86	72	59	46	35	22	10								
8	100	87	74	62	51	39	26	17	6							
10	100	88	76	65	54	43	33	24	13	4						
12	100	88	78	67	57	48	38	28	19	10	2					
14	100	89	79	69	60	50	41	33	25	16	8	1				
16	100	90	80	71	62	54	45	37	29	21	14	7	1			
18	100	91	81	72	64	56	48	40	33	26	19	12	6			
20	100	91	82	74	66	58	51	44	36	30	23	17	11	5		
22	100	92	83	75	68	60	53	46	40	33	27	21	15	10	4	
24	100	92	84	76	69	62	55	49	42	36	30	25	20	14	9	4
26	100	92	85	77	70	64	57	51	45	39	34	28	23	18	13	9
28	100	93	86	78	71	65	59	53	47	42	36	31	26	21	17	12
30	100	93	86	79	72	66	61	55	49	44	39	34	29	25	20	16







### ART PORTION

Turn your plan that you created for State Fair officials into an official design for alterations to make fairgoers more comfortable!

- ★ Create a large-scale map of the State Fair of Texas, or use the one that is available on the website (<http://bigtex.com/map/>) and have it printed out.
  - If possible, have it printed on a large printer – at least 11 x 14 inches.
- ★ Next, using a large transparency sheet (or tracing paper if that is not an option), draw your designs over the areas of the Fair where you have ideas to create a more comfortable space for fairgoers based upon your abiotic and biotic data.
  - Make sure that when you lay the transparency over the map that it lines up directly with the area that you are working on.
  - Also, if you have printed your map in black and white, create your overlay designs in color, or, vice versa.
  - In your presentation, be sure to elaborate on your creative choices in your design, and why you feel those would be best suited for the State Fair.
  - Get creative with this! Imagine that you have no limits with materials or design. Think about what types of designs would draw you to the Fair.
  - Also, don't forget, this is about functionality, so your design should be pleasing to the eye as well as serve the purpose of providing comfort to visitors.



### ENGLISH COMPONENT

Along with your map of alterations, provide State Fair officials with an official flyer that can be used to convince them of why the alterations are necessary.

When designing the flyer, make sure to:

1. Use professional software (i.e. Microsoft Publisher)
2. Use professional language (avoid slang words, contractions, informal words and sentence structure)
3. Include charts and graphs to support the data you collected at the Fair
4. Provide written explanations of the numerical data
5. Give logical and concise arguments to persuade officials to adopt your alterations

$$(x^2) - (x)(xy) \quad A = r \cdot s \cdot \cos a$$

