

## Sleep Graphs “*Quantify Your Dreams*”

### GOAL

Electrical activity in the brain cycles during sleep. Students gain experience with qualitative data collection and interpretation. Students gain experience in graphing quantitative data and begin to understand the cycling of electrical activity in the brain during sleep.



### Set-up:

- Drum
- Brain wave poster
- Drum frequency data sheet
- Labeled graph paper
- Poster graph
- Conclusions handout



### PROCEDURE

#### *Overview:*

Brain wave cycling during sleep is simulated with drum beats. Each interval, called by the instructor as the drum is played, represents 15 minutes of sleep so 8 hours of sleep can be "played" in about 3 minutes. Students record the relative speed of the beats (fast or slow) for each interval, discovering that there are 5 short periods of high frequency brain activity, separated by long periods of low frequency brain activity. Students are also given brain wave frequency in Hertz, collected at 15 minute intervals over an 8 hour period of sleep. The students are asked to graph this quantitative data.

#### *Engage (15 minutes)*

- Show poster of brain waves.
- Play patterns to represent waves while awake and waves while alert.
- Point out the 2 different wave patterns apparent while asleep, point out the similarity between the alert pattern and one of the sleep patterns. Ask students to think about what their similarity may signify.
- Discuss results of graphing, pointing out the 5 peaks of high frequency activity that represent dreaming.
- Review concept of frequency as events over a specific measurement. In this case we are measuring rhythmic frequency, beats over time.



## PROCEDURE

### *Explore (15 minutes)*

- Hand out qualitative data sheet.
- **Option:** Use a projection of sample data chart to instruct students in properly recording their data.
- Explain that they will write “F” or “S” for Fast or Slow in the third column under “Qualitative data”.
- There will be no medium speed beats.
- To play the beats on the drum, refer to the right hand column of the instructor sheet where each interval is assigned an “F” or “S”.
- Play 3 sample intervals, calling out interval numbers for students, indicating a data collection point. Students mark their sheets. (e.g.: Play a fast rhythm and say, “1”, slow down and say “2”, continue playing slowly and say “3”. Stop, be sure all understand, then continue.

### *Explain (10 minutes)*

- Discuss results of data collection.
- Have students write on the qualitative sheet what they think is happening during the fast waves.
- Confirm the idea that they are dreaming during that period.
- Guide discussion toward idea that during the first fast wave period the person is awake. They have just gone to bed.
- Review concept of qualitative vs. quantitative data guiding discussion to idea that the data we just collected is qualitative (the quality of the rhythm as ‘fast’ or ‘slow’ was collected).

### *Expand (Math Extension 30 minutes)*

- Students use the raw quantitative data (as shown on the instructor’s sheet) to create a bar graph on the enclosed graph paper.
- Ask, "From this data, what can we tell about the pattern of brain waves through the course of a typical night? (Answer: Brain waves do not go either fast or slow but in reality they speed up and slow down.
- Fast waves = REM sleep.

Note: Dreams do occur sometimes in slow wave sleep but this is uncommon.

- **Option:** Have a student come to the front and graph the first couple of data points on an overhead or laminated graph poster.

### *Evaluate (10 minutes)*

- Students complete graphing the data on their sheets individually.
- Ask, "From this data, please record how many dreams this person had during this sleep cycle."
- Students record the number of dreams.



*Using a data sheet, students create bar graphs representing slow wave sleep and rapid eye movement throughout the course of one night. They then study the pattern, counting the number of dreams the average person has in a single night, giving time estimates of the average length of, and interval between, these dreams.*

- **Key Cognitive Skills:**
  - Observation
  - Comprehension
  - Comparison
  - Analysis
- **Vocabulary Terms:**
  - Frequency
  - Hertz

● **Specific Outcomes:**

During dreams there is high frequency electrical activity in the brain and this occurs 4-5 times over an 8 hour period of sleep.

There is usually 90 minutes between each dream with low frequency electrical activity in the brain during the time between dreams.

### PROJECT 2061 BENCHMARKS FOR SCIENTIFIC LITERACY

#### 1A Nature of Science: Scientific Inquiry.

Students actively participate in a scientific investigation, and use cognitive and manipulative skills associated with the formations of scientific explanations. Students collect and analyze data on frequency of events over time and create graphic representations of that data.

#### 2B Nature of Mathematics:

##### Patterns and Relationships and Mathematical Inquiry.

Students are asked to determine frequency involving addition of events divided by time over which events occur.

#### 6C The Human Organism: Basic Functions

Students learn that different states of consciousness correspond to different patterns of electrical activity in the brain.



# Instructor's Brain Wave Sleep Data

Time of Night	Frequency (Hz)	Interval
9:00 PM	15	1 F
9:15 PM	7	2 S
9:30 PM	5	3 S
9:45 PM	3	4 S
10:00 PM	1	5 S
10:15 PM	1	6 S
10:30 PM	8	7 S
10:45 PM	4	8 S
11:00 PM	3	9 S
11:15 PM	1	10 S
11:30 PM	14	11 F
11:45 PM	7	12 S
12:00 AM	5	13 S
12:15 AM	4	14 S
12:30 AM	3	15 S
12:45 AM	1	16 S
1:00 AM	15	17 F
1:15 AM	6	18 S
1:30 AM	4	19 S
1:45 AM	3	20 S
2:00 AM	3	21 S
2:15 AM	1	22 S
2:30 AM	15	23 F
2:45 AM	8	24 S
3:00 AM	5	25 S
3:15 AM	4	26 S
3:30 AM	4	27 S
3:45 AM	3	28 S
4:00 AM	1	29 S
4:15 AM	14	30 F
4:30 AM	6	31 S
4:45 AM	4	32 S
5:00 AM	5	33 S
5:15 AM	2	34 S
5:30 AM	.5	35 S
5:45 AM	15	36 F
6:00 AM	8	

# Student Qualitative Sleep Data

Time of Night	Frequency (Hz)
9:00 PM	15
9:15 PM	7
9:30 PM	5
9:45 PM	3
10:00 PM	1
10:15 PM	1
10:30 PM	8
10:45 PM	4
11:00 PM	3
11:15 PM	1
11:30 PM	14
11:45 PM	7
12:00 AM	5
12:15 AM	4
12:30 AM	3
12:45 AM	1
1:00 AM	15
1:15 AM	6
1:30 AM	4
1:45 AM	3
2:00 AM	3
2:15 AM	1
2:30 AM	15
2:45 AM	8
3:00 AM	5
3:15 AM	4
3:30 AM	4
3:45 AM	3
4:00 AM	1
4:15 AM	14
4:30 AM	6
4:45 AM	4
5:00 AM	5
5:15 AM	2
5:30 AM	.5
5:45 AM	15
6:00 AM	8

