7.SP Election Poll, Variation 3

Alignments to Content Standards: 7.SP.A

Task

Members of the seventh grade math group have nominated a member of their group for class president. Every student in seventh grade will cast a vote. There are only 2 candidates in the race, so a candidate must receive at least 50% of the vote to be elected. It is expected to be a tight race, so the math group wants to conduct a survey to gain information on their candidate's prospects. They do not have the time to interview all seventh graders in the school (even if they could contact them) so they decide to interview a sample of 40 students from that grade. They obtain the seventh grade list of names from their school principal's office and select the sample from this list. They plan to ask each sampled student whether they plan to vote for their candidate or the other candidate.

a. How should the students select the sample of 40 from the list if they want to have the best chance of obtaining a representative sample? Use the random number table provided below, a random number generator, or a software program to help select the sample of 40 students.

Random Number Table Generated in Excel				
196	14	57	441	219
459	284	356	306	119
358	241	406	122	390
238	98	392	433	256
335	189	24	260	452
468	106	28	294	46
20	385	37	109	4
437	70	464	471	432
454	474	1	280	117
492	390	154	115	336
460	377	101	312	350
115	126	64	333	291
445	297	449	171	234
438	224	357	13	500
288	284	254	86	173
449	340	11	9	387
359	133	494	31	458
217	174	343	3	350
171	195	127	141	276
299	246	394	164	294

b. All of the 40 students selected from the list of seventh graders in the school responded to the survey. The results showed that 18 of the 40 students surveyed said they would vote for the math group's candidate. The math group is puzzling over whether this provides enough information for them to feel confident about their candidate winning with 50% of the vote. To get a sense of how much this sample result of 18 out of 40 could vary in random samples of size $n = 40$, the math group decides to repeatedly simulate the sample selection process and compute the proportion of sampled students that would vote for their candidate for each repeated sample.

Because they are interested in whether their candidate can win with 50% of the vote, they decide to simulate assuming that the seventh grade class is divided 50-50 between the two candidates (50% voting for the math group candidate and the other 50% voting for the other candidate).

i. Carry out this simulation by taking samples of 40 students and recording the proportion of students in the sample that would vote for the math group's candidate. Repeat the sampling process 100 times. To carry out the process, use a random number generator or a software program.

ii. Draw a dot plot to represent the outcome of the 100 simulations.

iii. How many times does the selected sample reflect that 18 or fewer students out of the 40 sampled would vote for the math group's candidate?

iv. If 50% of the class was going to vote for the math group's candidate, then is the sample outcome of 18 out of 40 voting for the math group's candidate a reasonably likely occurrence? In other words, is the 50% population percentage plausible given the observed sample proportion of 45%?

v. Using your answers to (i) and (ii), should the math group students conducting the poll be discouraged, or is it reasonable to think their candidate might win? Why or why not?

c. Now, the math group is puzzling over whether their 18 out of 40 provides enough information for them to think that the percentage who favor their candidate might be 60%. They decide to repeat the simulation only this time, they decide to simulate assuming that the seventh grade class is divided 60-40 between the two candidates (60% voting for the math group candidate and the other 40% voting for the other candidate).

i. Carry out this simulation by taking samples of 40 students and recording the proportion of students in the sample that would vote for the math group's candidate. Repeat the sampling process 100 times. To carry out the process, use a random number generator or a software program.

ii. Draw a dot plot to represents the outcome of the 100 simulations.

iii. How many times does the selected sample reflect that 18 or fewer students out of the 40 sampled would vote for the math group's candidate?

iv. If 60% of the class was going to vote for the math group's candidate, then is the sample outcome of 18 out of 40 voting for the math group's candidate a reasonably likely occurrence? In other words, is the 60% population percentage plausible given the observed sample proportion of 45%?

v. Using your answers to (i) and (ii), should the math group students conducting the poll be discouraged, or is it reasonable to think their candidate might win 60% of the vote? Why or why not?

IM Commentary

This task introduces the fundamental statistical ideas of using data summaries

(statistics) from random samples to draw inferences (reasoned conclusions) about population characteristics (parameters). In the task built around an election poll scenario, the population is the entire seventh grade class, the unknown characteristic (parameter) of interest is the proportion of the class members voting for a specific candidate, and the sample summary (statistic) is the observed proportion of voters favoring the candidate in a random sample of class members. There are three variations of this task.

Variation 1 asks the students to demonstrate how to use a random number table to select a random sample of 40 students for a class list. Then, they must draw a conclusion as to whether or not it is plausible for the population proportion to be 50% or more, given that a random sample showed only 45% favoring their candidate. They are not told how to justify their conclusion statistically, so would probably need some hints that simulation is about the only tool they have to work with at this level.

Variation 2 leads students through a physical simulation for generating sample proportions by sampling, and re-sampling, marbles from a box. It then provides detailed questions and suggestions on making a plot of the simulated sample proportions and drawing appropriate conclusions about the population proportion based on the distribution of observed sample proportions.

Variation 3 introduces technology and encourages students to use a random number generator or statistics software to generate a random sample of student responses and to simulate a distribution of sample proportions from a population with 50% successes. It then leads students through the statistical reasoning to conclude whether or not it is plausible that the candidate could have 50%, or even 60%, of the vote.