

## Pilot test results Monarch Mystery Case

Eight students were recruited to read the paper-based materials and answer the questions for each of the tasks in this formative assessment of the instructional materials. Students also piloted the pretest and answered survey questions.

### Demographic data:

Student ID #	Student Gender	Student Age	Student Grade
01	male	12	07
02	female	12	07
03	male	15	10
04	female	13	08
05	female	13	08
06	male	15	10
07	female	12	07
08	male	15	10

### Pretest:

The pretest presented students with a problem on a space station and data to determine what might be causing the illnesses of the astronauts on the space station. [Science Snoops Pretest](#)

Pretest pilot results:

Student ID #	What is the problem on the space station? 3 points	How would you use the given information and data to determine the possible causes of the illnesses? 3 points	What would you do next? What further data would you collect? How would you analyze the data to determine what it means? 6 points	How would you present your results? To whom would you present them? 15 points	Total possible points : 27	% correct answers	Time for Pretest
01	2	2	2	3	9	33	2 hrs
02	1	1	1	2	5	19	40 min
03	2	2	2	2	8	30	1 hr
04	1	2	2	4	9	33	15 min
05	2	2	1	1	6	22	10 min
06	2	3	3	4	12	44	1 hr
07	2	1	1	2	6	22	40 min
08	1	2	2	2	7	26	30 min

Conclusion: Seven of the students correctly concluded that two of the astronauts probably had food poisoning. However, many other points were missed in part

because the students did not give sufficient details for their conclusions and/or did not have the communication skills, e.g.: “Illnesses include contaminated utensils...” “The problem is food poisoning. It’s results from testing are higher than its dangerous level.” These students did not demonstrate that they have the skills to conduct an investigation that includes a hypothesis, a procedure, data collection, data analysis, and the development and communication of a logical, data-driven conclusion.

**Paper-based Monarch Mystery Case pilot testing results:**

Students were given 86 pages of written materials that consisted of references, data, graphs, and tasks. [Example: the final report task](#). Students selected likely hypotheses from those presented, as well as data to analyze and conclusions to draw. 7 out of the 8 students concluded correctly that the data support the hypothesis that the monarch numbers have declined at the fictitious Miller’s Pond site and that the most likely impact on the monarch population was the use of herbicides in nearby crop fields. However, as can be seen from the table below, not all of the students were able to achieve a high number of correct answers out of the 141 questions.

Student ID #	Student Age	Tasks total points out of 141 possible	% correct answers	Time spent on the case:
01	12	121	86%	6 hours
02	12	94	67%	3 days
03	15	113	80%	2 hours
04	13	78	55%	4 hours
05	13	75	53%	1.5 hours
06	15	103	73%	2.5 hours
07	12	95	67%	6 hours
08	15	115	82%	90 minutes

Conclusion: Students did better when they were guided in their investigation as compared to the pretest pilot. The time spent on the tasks varied considerably among the eight students.

### Survey results:

Student ID #	Age of student	Did you use additional materials?	Did you get help?	Likes	Dislikes
01	12	no	yes	I liked learning things about butterflies that I didn't know. Most of the questions seemed pretty easy once the material was read. The math that was needed was really simple. I like math so I would have liked having the numbers and averaging them myself.	It was a lot of reading. Some of the questions needed to be more specific. Example: page 78 would be better if it read "may be" or "is the only"
02	12	yes, a calculator	yes	I liked looking at the resumes. It was not fun. Only OK.	How long it was. It was boring. I would change it by making it more for kids. Make shorter.
03	15	no	yes	Interesting learning about herbicides/pesticides.	Kinda slow; baby steps, answers given to you; 9th and 10th graders may lose interest quickly.
04	13	yes	a little	This was fun. I liked reading all the graphs and finding out interesting information on butterflies.	It was too much to read.
05	13	yes, a pen	no	I guess [unknown word] it kept me busy.	I didn't like it. I'm on the honor roll and I am taking high school math and I still didn't understand this.
06	15	yes	yes	This was fun. I liked reading all the graphs and finding out interesting information on butterflies.	Yes, it was boring in some places. I would have given several places for incorrect responses to go, and have a feature that directed someone as to where they went wrong. Other than that, it was good.
07	12	yes, a calculator	yes	[What did you like about the case?] I liked looking at the resumes. [Was it fun?] It was not very fun, but okay. [What were the best parts?] reading.	[What did you not like about it?] How long it was. [What was boring?] sort of boring. [What would you change about the case?] Shorter, more so kids would enjoy it.
08	15	no	no	It was interesting to start by researching monarch related things before getting relevant data and performing tests. This is a different approach than many people would likely take. Also, the use of realistic emails was very cool. When this is on the computer, I also think the videos and sounds would be neat.	Pretty much the only think I found boring was the extensive amount of reading. However, when this is on the computer I think the occasional videos and sounds will fix this.